

TurboCAD for AutoCAD Users

TurboCAD

Version 4

TurboCAD for AutoCAD Users

IMSI™

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TurboCAD for AutoCAD Users

Introduction

TurboCAD for AutoCAD Users

If you are an AutoCAD user, then you are probably curious about how TurboCAD compares with AutoCAD. Here we take a look at what TurboCAD offers the AutoCAD user, the major differences between AutoCAD and TurboCAD, and some of the drawbacks to TurboCAD.

What TurboCAD Offers the AutoCAD User

TurboCAD offers the AutoCAD user many advantages, including DWG compatibility, an improved user interface, node editing, more flexible width and fill pattern capability, a drag 'n drop block library, built-in raster-to-vector conversion, and multiple document interface.

DWG Compatibility

TurboCAD reads a variety of vector file formats, including many of the files produced by AutoCAD:

- ž AutoCAD DWG up to and including Release 13. See chapter 4 for complete details.
- ž Autodesk DXF drawing interchange format, up to and including Release 13.
- ž Autodesk DWF, drawing Web format).
- ž Spatial Technology SAT, the ASCII version of ACIS solid models.

Check with IMSI for the availability of the Release 14 translator. TurboCAD also reads files in these vector formats: Microsoft WMF (Windows metafile) and HPGL, Hewlett-Packard graphics language.

In addition, TurboCAD can import AutoCAD drawings and symbols via the Windows Clipboard. AutoCAD drawings can be inserted into TurboCAD as an OLE object. See Chapter 5 for complete details.

Improved User Interface

As an AutoCAD user, you know that Release 14 uses a half-dozen commands for changing the properties of an object: Change, ChProp, DdChProp, DdModify, MatchProp, and Xplode. TurboCAD has a single **Property** dialog box that controls all aspects of the selected object: style, layer, color, linetype, hatch pattern, line width, and text. See Chapter 1 for more details.



TurboCAD's Property toolbar

Node Edit and Select Cursors

In AutoCAD, you probably find the PEdit, SplinEdit, and similar commands cumbersome to use. In TurboCAD, you edit polylines and splines directly with the node edit cursor:



TurboCAD's node edit cursor (left) and select cursor (right)

Similarly, the Move and Rotate commands are missing from TurboCAD; instead, you use the select cursor to move and rotate the selected object by using grips. See Chapter 1 for more details.

Widths, Fills, and Object Styles

In AutoCAD, only 2D polylines and traces are allowed to have widths. TurboCAD allows you to assign width to any object. In addition, any closed object (such as circles and polygons) can be automatically filled with a hatch pattern.



TurboCAD's widths and fills

In AutoCAD, you can create named styles for text that predefines its height, font, width, orientation, etc. TurboCAD allows you to create styles that apply to any object, including text. See Chapter 2 for more details.

Drag 'n Drop Block Library

To place a block in the drawing, you simply drag it from TurboCAD's **Symbol Library** into the drawing. Any file that TurboCAD can read is available as a symbol — even AutoCAD DWG files. Creating a new block is as simple as selecting the object and using the **Create Block** command; names are assigned automatically.

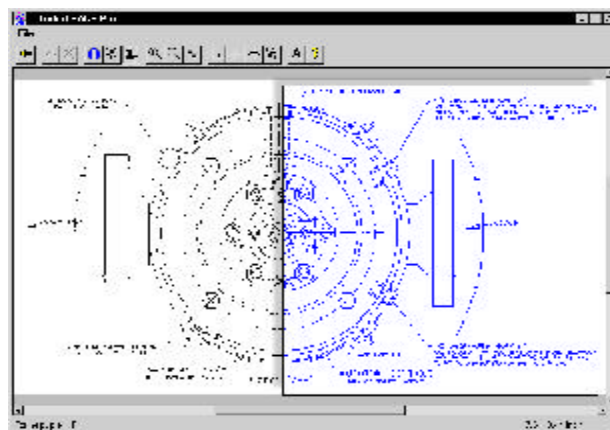


TurboCAD's Symbols palette

Notice the wording on the tabs under the palette in the figure, above. The same palette that displays the symbol library also displays **Measurement Info** (reports distance and area data like a paper tape) and **Selection Info** (specifically, the object hierarchy and database details of selected objects).

Raster-to-Vector Conversion

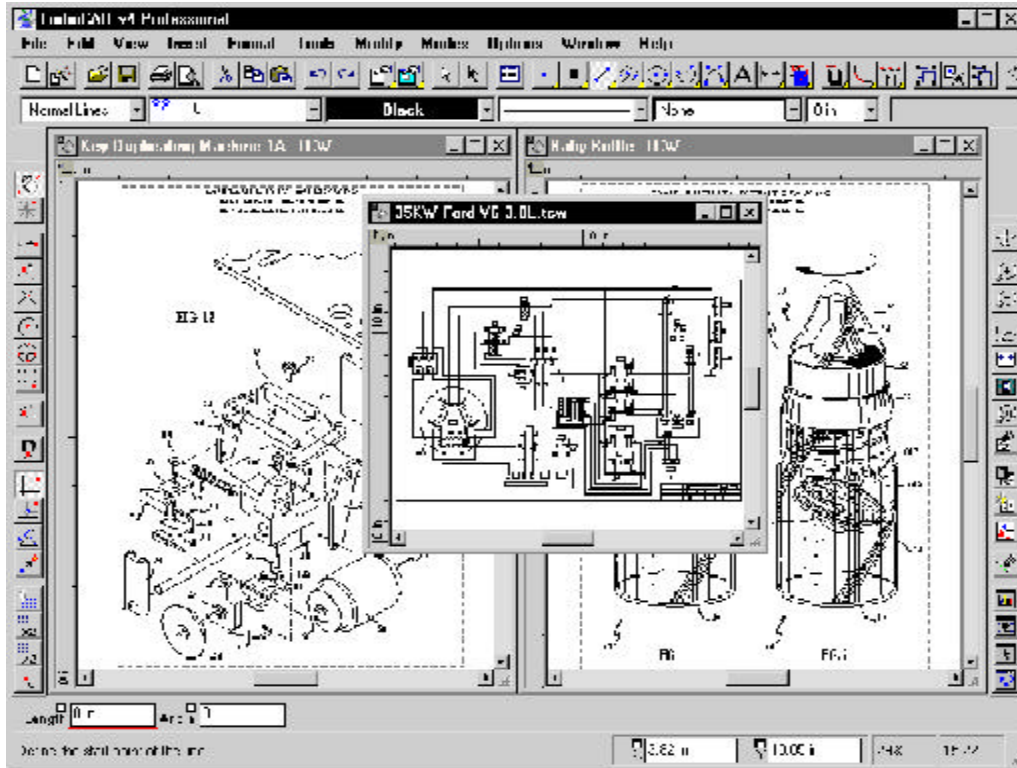
TurboCAD Professional includes a module for converting scanned raster images to vector files. The conversion module includes settings optimized for different kinds of scans: logos, mechanical drawings, detail drawings, etc.



TurboCAD Professional's raster-to-vector converter

Multiple Document Interface

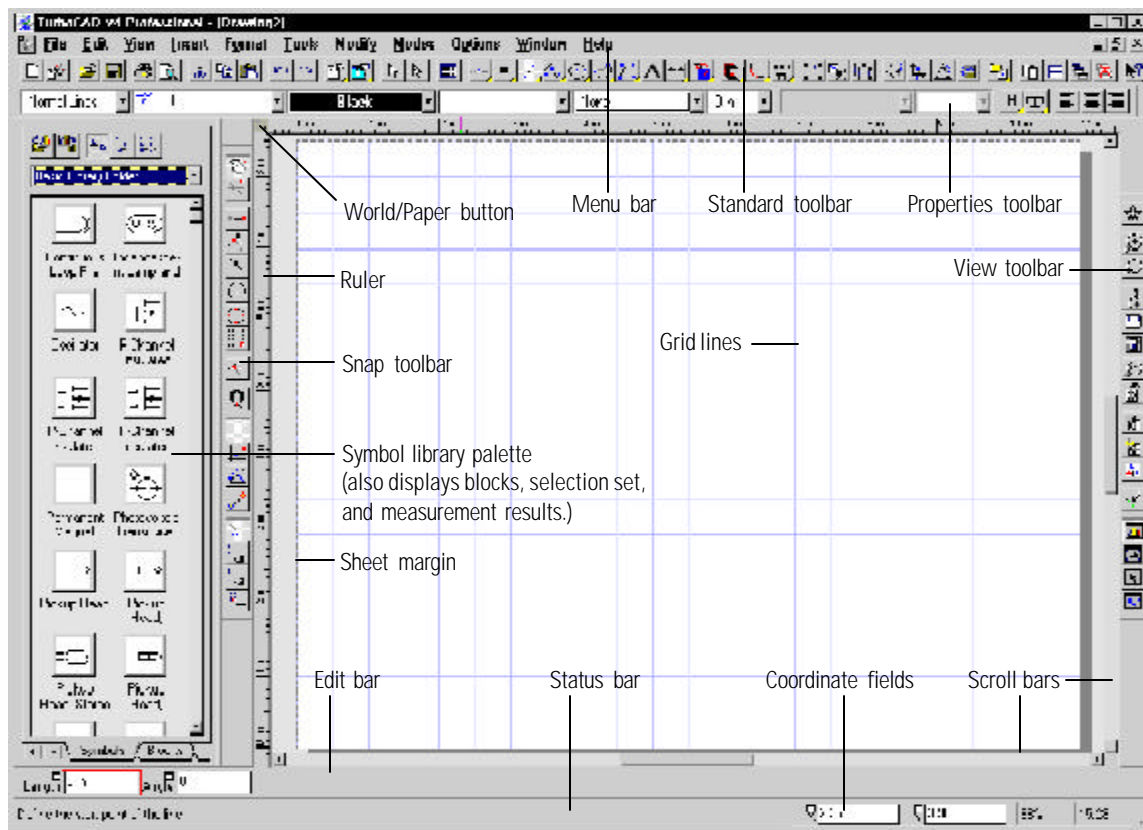
Unlike AutoCAD, you don't have to launch multiple copies of TurboCAD just to see more than one drawing. Like most true Windows applications, TurboCAD loads many drawings at a time, each in its own window. Better yet, you can drag objects from one drawing to another.



TurboCAD's multiple document interface

The TurboCAD User Interface

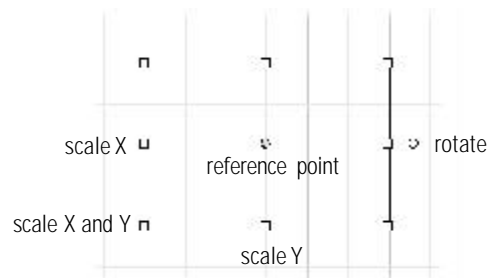
Because of Windows, much of TurboCAD's interface is the same as AutoCAD's. You already know how to use the menu bar, toolbars, scroll bars, the status line, etc. Here is an overview of the TurboCAD user interface and the primary elements:



TurboCAD at 1024x768 screen resolution

Handle-based Editing

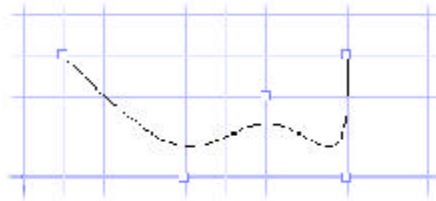
Selecting one or more objects with TurboCAD's Select cursor displays handles — just like in AutoCAD. However, TurboCAD's handles are more intuitive. There is no need to press the spacebar to toggle through AutoCAD's handle editing commands.



TurboCAD's scale, rotate, and move handles

Node Editing

Node editing is an effectively, interactive editing command that replaces the PEdit, SplinEdit, MIEdit, DdModify, and similar commands in AutoCAD. Node edit mode is limited to editing one object at a time. The figure shows a spline curve being edited by its nodes.



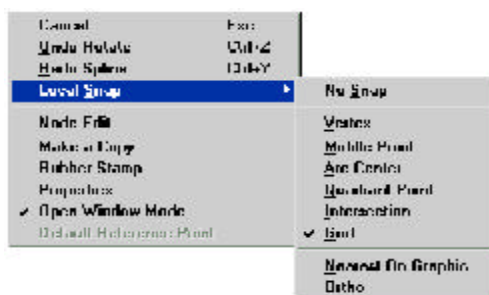
TurboCAD's node edited object

The table below shows the many ways Node edit changes objects in TurboCAD:

Selected Object	Related Node Editing Functions
Arc	<ul style="list-style-type: none"> Changeradius. Change start and end angles. Divide into arc segments of equal length. Close arc (converts arc to circle).
Bezier and spline curves	<ul style="list-style-type: none"> Add, erase, and move nodes. Move tangent points.
Circle	<ul style="list-style-type: none"> Change radius Divide into arc segments of equal length.
Double line	<ul style="list-style-type: none"> Add, erase, and move nodes. Close endpoints. Drop gaps if the double line has been trimmed or extended to other lines or double lines.
Ellipse and elliptical arc	<ul style="list-style-type: none"> Change major and minor axes. Change start and end angles. Close elliptical arc (converts to an ellipse).
Line	<ul style="list-style-type: none"> Divide into multiple segments. Aad, erase, and move nodes.
Multiline	<ul style="list-style-type: none"> Close multiline (coverts to a polygon). Hide line segments.
Polygon	<ul style="list-style-type: none"> Add, erase, and move nodes. Explode into line segments.
Sketch curve	<ul style="list-style-type: none"> Add, erase, and move nodes.

Local Menu

Right-click an object to bring up the context-sensitive local menu (a.k.a. *cursor menu*). The local menu is related to the current tool being used (when in Select mode). It usually contains a **Properties** option to access the properties of the selected object.



TurboCAD's local menu in Select mode

In node edit mode, the local menu's options change to reflect object-specific commands, such as **Segment Divide**.



TurboCAD's local menu in node edit mode

How TurboCAD Differs from AutoCAD

Right away, the biggest difference you'll notice between TurboCAD and AutoCAD is that *all* commands automatically repeat until you select another command. No need for the Multiple command modifier! Some other crucial differences include:

Jargon

Many terms in TurboCAD are similar to AutoCAD but there are some differences. For example, the TurboCAD "multiline" is not the 16-parallel lines found in AutoCAD. Instead, the TurboCAD multiline is a multi-segment line, also sometimes called a "polyline" by TurboCAD. However, the TurboCAD polyline lacks the curve capabilities found in AutoCAD. A TurboCAD-AutoCAD dictionary is available in Appendix B.

Property Toolbar

TurboCAD's **Property** toolbar is a more powerful version of AutoCAD's Object Properties toolbar. Instead of controlling just the color, linetype, and layer, TurboCAD also lets you select the line width, hatch pattern, and toggle between normal and construction lines. It also displays text properties when you are working with text.



TurboCAD's Property toolbar

Edit Bar

TurboCAD's **Edit** bar is a visual version of AutoCAD's direct distance entry. For example, when you start drawing a line, the Edit bar displays the length and angle in real-time. As you move the cursor, the length and angle display updates continuously. This is similar to AutoCAD's coordinate display in relative mode.



TurboCAD's Edit bar

To draw the line at a specific angle: start the line at any point using the mouse with any snap modes. The same works for the **Length** display. In fact, the Edit bar changes its display, depending on the object you are drawing. You can lock any Edit bar option; notice the "x" in the Length field below:



Edit bar showing frozen Length

Coordinate Fields

The coordinate fields display the current x,y-coordinates. Press **<Shift>+<Tab>** to change the value of **X** and **Y**. The lock boxes are the equivalent to using .y and .x point filters in AutoCAD. TurboCAD displays coordinates in absolute, relative, and polar coordinates. To quickly change between them, press **<Shift>+A** for absolute coordinates, **<Shift>+R** for relative, and **<Shift>+P** for polar display.



TurboCAD's coordinate field

The coordinate fields at the bottom of the screen can be used together with the Edit bar to place objects in the drawing. For example, you can draw a line, as follows:

Step 1: Press <Shift>+<Tab>

Step 2: Press <Enter> to start drawing the line.

Step 3: Press <Tab> to enter the **Length** in the **Edit** bar.

Step 4: Press <Tab> again to enter the **Angle**.

Step 5: Press <Enter> to define the point.

TurboCAD Drawing Commands

Here is a summary of many common TurboCAD drawing commands and their **Edit** bar options (*AutoCAD translation in parentheses*):

Drawing Command	Edit Bar Options				
Arc	Radius	Circumference	Start Angle	End Angle	Length
Circle	Radius	Circumference			
Curve, Bezier or Spline	Length	Angle			
Dimension	Text	Angle	Length		
Dot (<i>Point</i>)	...				
Double Point Circle (<i>Circle 2P</i>)	Diameter	Circumference	Angle		
Ellipse	Major	Minor			
Fixed Ratio Ellipse	A:B Ratio				
Irregular Polygon	Length	Angle			
Line	Length	Angle			
Multiline (<i>multi-segment Line</i>)	Length	Angle			
Path Hatching (<i>Hatch</i>)	...				
Polygon	Sides	Angle	Radius		
Rectangle	Size A	Size B			
Rotated Ellipse	Major	Angle	Minor		
Rotated Rectangle	Size A	Angle	Size B		
Sketch	...				
Text	Height	Angle			
Triple Point Circle (<i>Circle 3P</i>)	...				
Viewport	...				

TurboCAD Editing Commands

This table of many of TurboCAD's editing commands lists their parameters on the Edit bar:

Editing Command	Edit Bar Options					
Align Along Line	Angle					
Chamfer	Dist A	Dist B				
	Distance	Angle				
	Length	Angle				
Copy Array (<i>Array Rectangular</i>)	XScale	YScale	Rotation	XStep	YStep	Rows Cols
Copy Linear (<i>Divide</i>)	XScale	YScale	Rotation	XStep	YStep	Sets
Copy Mirror	Angle					
Copy Radial (<i>Array Polar</i>)	XScale	YScale	Rotation	Sets	Angle	+Rotation
Copy Vector (<i>Copy</i>)	Length	Angle				
Fillet	Radius					
Line Length (<i>Lengthen</i>)	Length	Delta L				
Meet Two Lines (<i>Fillet R=0</i>)	...					
Node Edit	XScale	YScale	Rotation			
Object Trim	<i>none</i>					
Select	XScale	YScale	Rotation			
Shrink/Extend Line (<i>Extend</i>)	...					
Split (<i>Break</i>)	Ratio	:				
Stretch	Length	Angle				

What's Missing from TurboCAD

The AutoCAD user has come to expect a certain selection of commands, which you might not find in TurboCAD. For example, TurboCAD lacks AutoCAD's ability to draw variable-width splines, polylines, and complex (2D) linetypes. On the other hand, TurboCAD contains commands lacking in AutoCAD. For example, AutoCAD lacks TurboCAD's ability to quickly draw concentric circles.

You may find some of TurboCAD's commands a bit odd. For example, there is a command that draws a line perpendicular to another line. The AutoCAD user would wonder why a separate command is needed, instead of just using Perpendicular object snap. (TurboCAD does have a Perpendicular snap mode but it is available only as a keyboard character and only on the second point of a line.)

While TurboCAD has an implementation of model and paper space, it is much weaker than the two spaces found in AutoCAD. The sole difference between TurboCAD's world and paper space is the scale factor: in world space, dimensions are multiplied by the scale factor; in paper space, the dimensions are divided by the scale factor.

TurboCAD lacks 3D; it is 2D only. To draw in 3D, use the separate **TurboCAD 3D** product. If necessary, you can import the 3D file into TurboCAD. Because 3D is lacking, there are no 3D drawing and editing commands; no equivalent to a UCS (user coordinate system); and no hidden-line removal or rendering.

TurboCAD has a Z-coordinate but it is not exposed via the user interface. A 3D object can be rotated if it is turned into a block and then its block properties are edited. The next release of TurboCAD is due to integrate 3D.

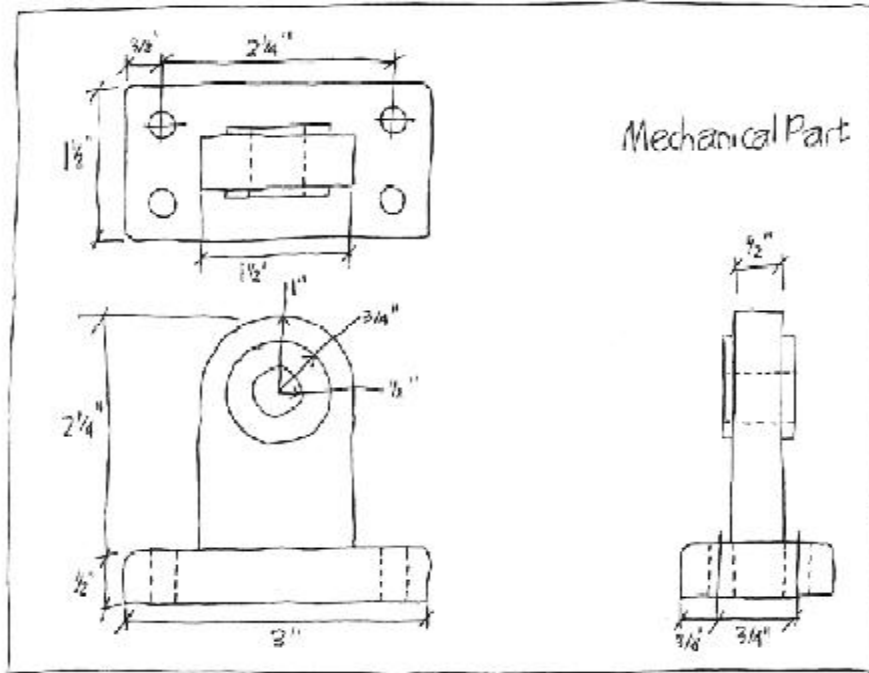
TurboCAD lacks the many programming interfaces that AutoCAD has. On the other hand, this means you learn a single programming language to program TurboCAD: EnableBasic. This is different from the AutoCAD users, who need to learn menu macros, toolbar macros (they have a different syntax from menu macros), scripts, Diesel, AutoLISP, and the ADS and ARx APIs (short for "applications programming interface") — along with whatever programming language you choose to use with ADS and ARx.

How to Use This Tutorial

To better understand how TurboCAD compares with AutoCAD, we invite you to sit through a parallel design session. We describe AutoCAD on the left-hand page and TurboCAD on the right side. We'll be working with the most recent version of both CAD packages: **AutoCAD Release 14** and **TurboCAD Professional Version 4.0**.

Since you are most familiar with AutoCAD, we recommend you work through this tutorial with TurboCAD running on your computer. As you work through the lessons on the right-hand TurboCAD pages, keep one eye on the left-hand AutoCAD pages. That will help orient you.

The drawing we will be using for this tutorial is the 2D drawing of a small mechanical part that fits a standard A-size sheet of paper. This drawing lets us draw lines, arcs, dimensions, and apply fillets.



Hand sketch of sample drawing exercise

When You Need More Help

In Appendix A, at the back of this manual, we provide a list of every one of AutoCAD Release 14's commands, along with the equivalent command in TurboCAD and an explanation of differences. Throughout the text, we provide a translation of jargon unique to TurboCAD. The AutoCAD jargon is listed in parentheses following "a.k.a." (short for "also known as"). For example:

line style (a.k.a. *linetype*)

Appendix B provides a TurboCAD-AutoCAD dictionary, listing TurboCAD jargon in alphabetical order with the AutoCAD translation.

If you need more help, refer to the on-line documentation available in TurboCAD. Select **Help | TurboCAD Help Topics** from the menu bar.

1

Setting Up the Drawing

Scale, Units, Layers, and Save

In this lesson, you learn how to set up the drawing in preparation for creating the mechanical part. Setting up a new drawing includes:

- Starting the CAD software.
- Using the **Page Setup Wizard** to set the drawing scale and other parameters.
- Setting the units, and selecting the drawing border from a template file.
- Creating the layer names.
- Setting the snap and grid spacing.
- Giving the drawing a filename.

AutoCAD



To start AutoCAD Release 14 for Windows, double-click on its icon. It takes AutoCAD about 30 seconds to start, depending on the speed of your computer.

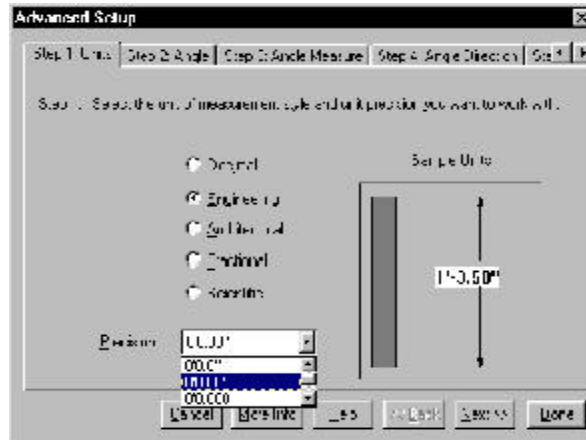
Drawing Set Up Wizard

After AutoCAD starts, the first thing you see is the **Start Up** dialog box. Select the **Advanced Setup** wizard to help you set the properties for this new drawing.



AutoCAD's Advanced Setup wizard

1. Click **Use a Wizard**. Of the two choices, select **Advanced Setup**, then click **OK**. AutoCAD displays the **Advanced Setup** dialog box, a tabbed dialog box.



AutoCAD's Units setup dialog box

2. Step 1 of the setup is to select the display format of units. Select **Engineering** units and a precision of **2** decimal places (looks like 0'0.00"). Click **Next**.

TurboCAD



To start TurboCAD Professional version 4 for Windows, double-click its icon. It takes TurboCAD about 25 seconds to start.

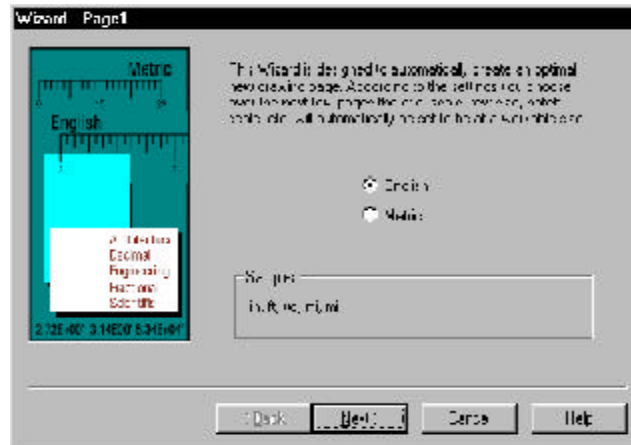
Drawing Set Up Wizard

After TurboCAD starts, the first thing you see is the **Tip of the Day**. Read it and click **OK**. The **New TurboCAD Drawing** dialog box appears. Use the **Page Setup Wizard** to help set the parameters for this new drawing.



TurboCAD's Page Setup Wizard

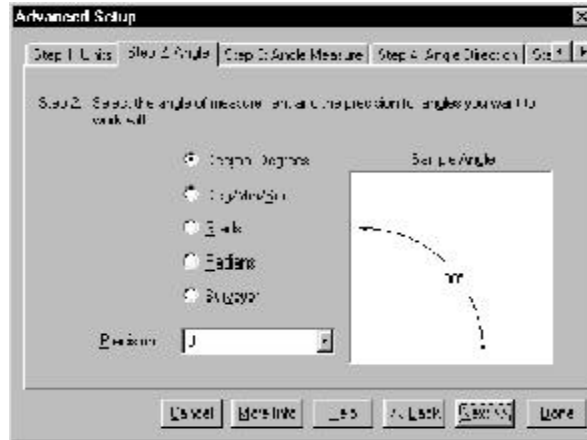
1. Click **New from Page Setup Wizard**. TurboCAD displays the **Wizard** dialog box.



TurboCAD's Wizard dialog box

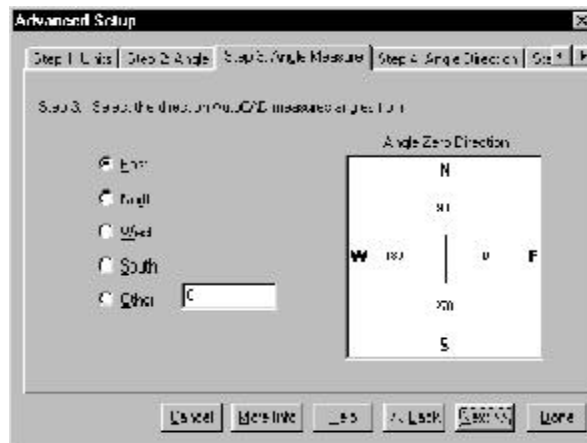
2. Page 1 selects the display format of units. Select the default of English units. Click **Next**.

3. AutoCAD displays the **Step 2 - Angle** tab for the display of angle units. Accept the default of decimal degrees and zero decimal places by clicking **Next**.



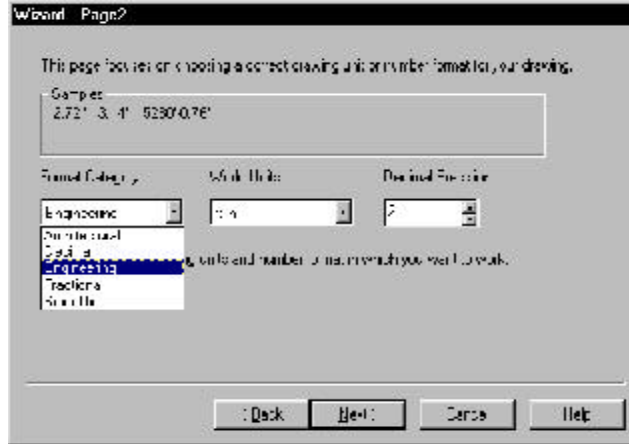
AutoCAD's Angle setup dialog box

4. AutoCAD displays the dialog box for step 3, angle measurement. This determines where AutoCAD begins to measure angles. Accept the default of **East** by clicking **Next**.



AutoCAD's Angle Measurement setup dialog box

- TurboCAD displays the **Wizard - Page 2** dialog box for the display of drawing units. Select **Engineering** (ft-in). Accept the default of **2** decimal places by clicking **Next**.

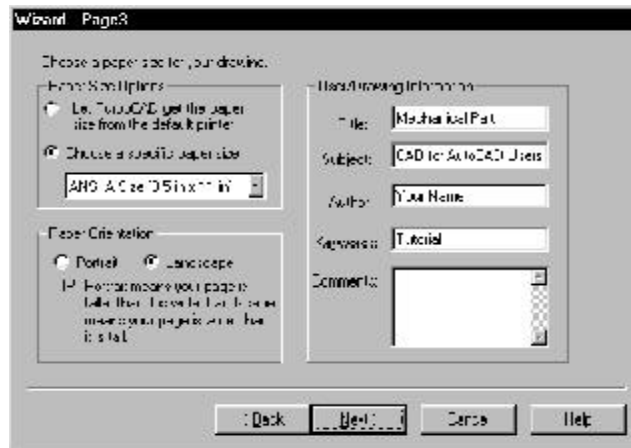


TurboCAD's units setup dialog box

- TurboCAD displays the dialog box for Page 3, drawing size. In **Paper Size Options**, select **Choose a Specific Paper Size** and ensure that "ANSI A Size" is showing. For **Paper Orientation**, select **Landscape**. In the **User/Drawing Information** section, type the following:

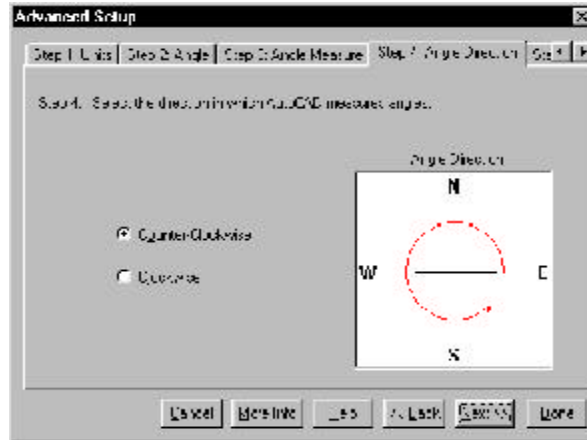
Section	Example Text
Title	Mechanical Part
Subject	TurboCAD for AutoCAD Users
Author	Your Name
Keywords	Tutorial, Mechanical

Click **Next**.



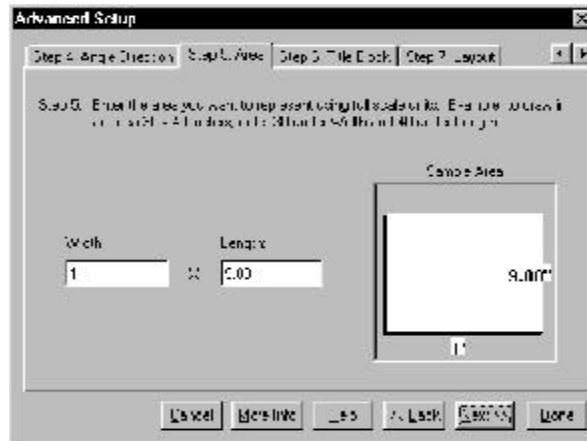
TurboCAD's paper size dialog box

- Step 4 determines the direction that angles are measured. Accept the default of counter-clockwise by clicking **Next**.



AutoCAD's Angle Direction setup dialog box

The fifth step sizes the drawing. See the TurboCAD side for the calculations to determine page size or 6" and 6.5". Since these numbers are less than the defaults of 1' and 9", accept them by clicking **Next**.



AutoCAD's Area setup dialog box

5. Page 4 determines the scale. This is perhaps the most important step, since it affects the scale factor of the drawing elements, such as text, dimensioning, and hatch patterns. Looking at the mechanical part you plan to draw, add up the widths and heights of each view, allowing a half-inch around the edges for dimensioning:

- For the overall width, calculate 6" (0.5" + 3" + 0.5" + 1.5" + 0.5").
- For the overall height, calculate 6.5" (0.5" + 3.5" + 0.5" + 1.5" + 0.5").

Since you want to fit the drawing on an A-size sheet, which is 11" wide and 8.5" tall, select an engineering **Scale** of "1"=1" (Full Size)." Complete the **Page Setup Wizard** by clicking **Finish**.

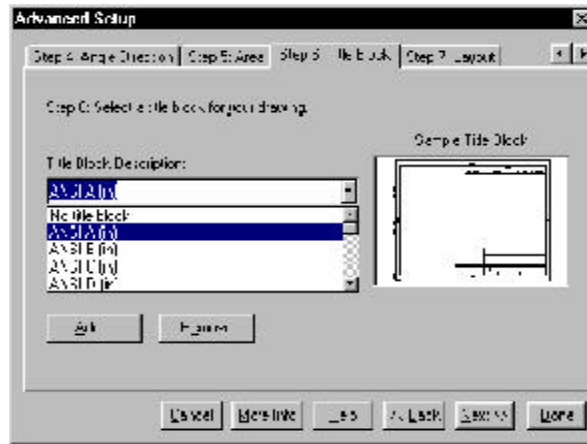


TurboCAD's Wizard - Step 4 dialog box

Inserting the Template Drawing

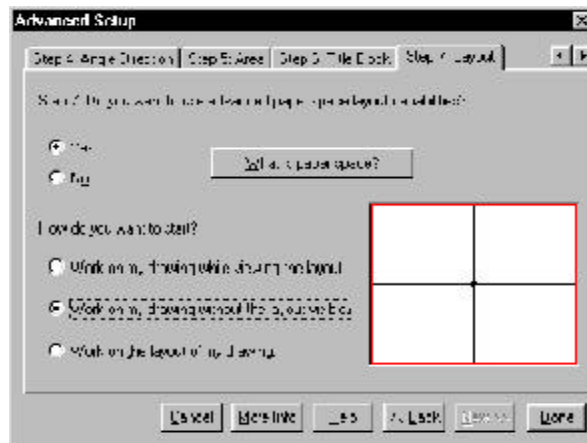
Release 14 includes template drawings with borders for A (A4) through E (A0) sizes in ANSI, ISO, DIN, and JIS standards, plus a couple of generic drawing borders.

1. Step 6 of the **Advanced Setup Wizard** asks you to select a template drawing. Select “ANSI A (in),” which is a horizontal A-size drawing border — a size well-suited for the typical office laser printer. Click **Next**.



AutoCAD's Title Block setup dialog box

2. Select **Yes** for paper space, then select **Work on my drawing without the layout visible** since you don't want to see the drawing border until near the end of the drawing exercise.



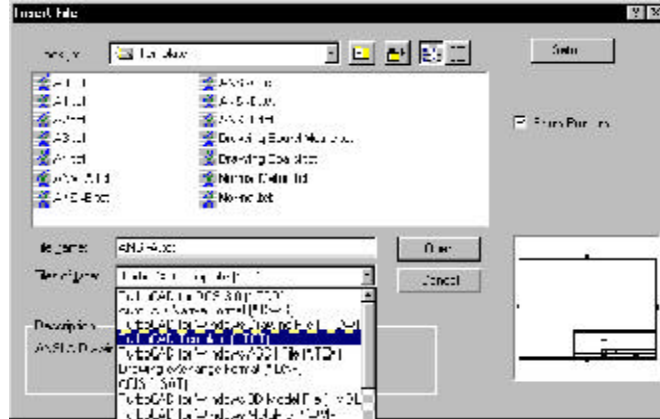
AutoCAD's Layout setup dialog box

3. Complete the **Advanced Setup Wizard** by clicking **Done**. You briefly see the ANSI A border as AutoCAD loads it into paper space, then disappears as AutoCAD switches to model space.

Inserting the Template Drawing

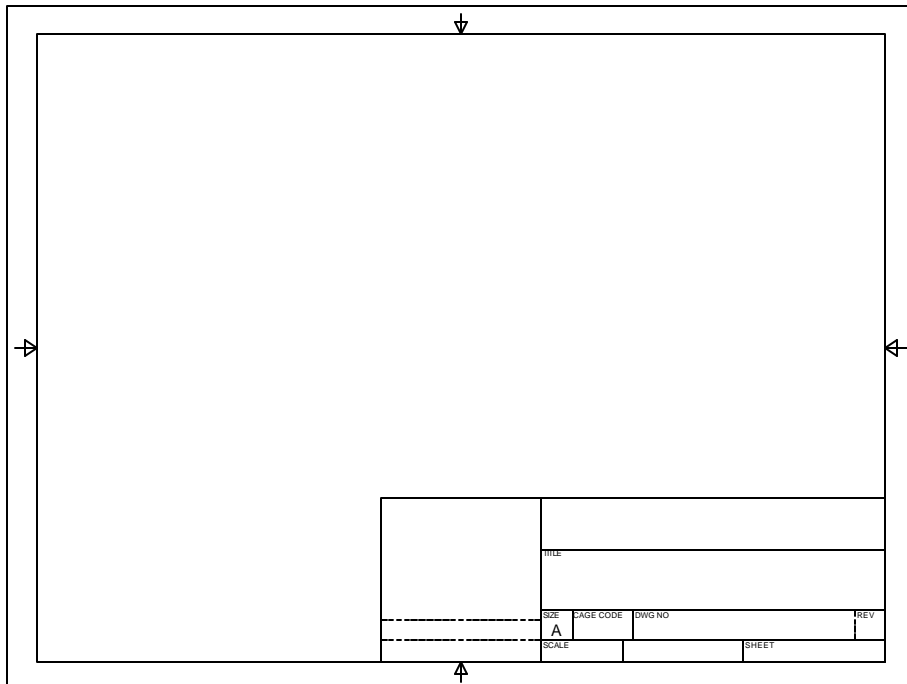
The next stage is to insert the ANSI A-size template drawing.

1. From the menu, select **Insert | File**. When the dialog box appears, select “TurboCAD Template (*.TCT)” for **Files of Type**. If necessary, change **Look In** to the **Template** subdirectory.



TurboCAD's Insert File dialog box

2. Double-click the “ANSI-A.tct” filename to load it into the drawing.



TurboCAD's ANSI-A.Tct drawing

Creating Layers

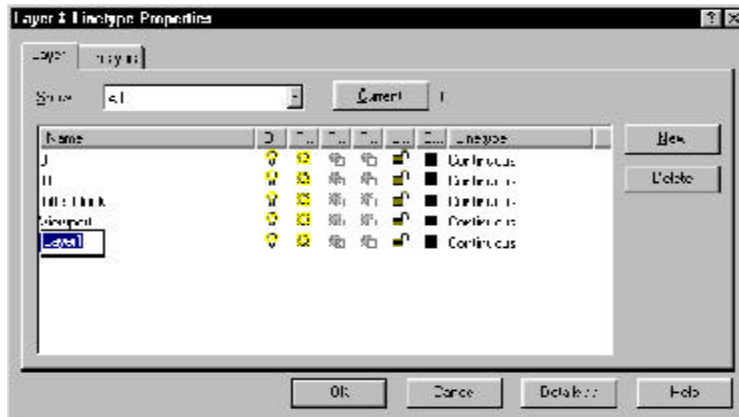
Via the Advanced Setup process, AutoCAD has already created four layers in the drawing. The next step is to create additional layers for this drawing.

1. Create layers with the **Layer** command or by selecting **Format | Layer** or clicking the **Layers** icon on the **Object Properties** toolbar. AutoCAD displays the **Layer & Linetype Settings** dialog box. Create four more layers, with the following properties:

New Layer Names	Color	Linetype
Steel	Black	Continuous
Dims	Red	Continuous
Hatch	Yellow	Continuous
Hidden	Blue	Hidden

Existing AutoCAD Layers	Meaning
0	The unerasable layer name present in all drawings.
TB	Holds title block attribute data.
Title_block	Contains the title block.
Viewport	The viewport borders visible when Tilemode is off.

2. To create a new layer, click **New**. AutoCAD creates a new layer with the default name of “Layer1”:



AutoCAD's Layer & Linetype Properties dialog box

3. Replace the “Layer1” text with “Steel” and press **Enter**.

Creating Layers

Via the Page Setup process, TurboCAD has already created two layers in the drawing.

1. Create layers with the **Drawing Setup** dialog box. Select **Options | Layers**. TurboCAD displays the **Drawing Setup** dialog box with the **Layers** tab showing. Note how this dialog box handles all aspects of setting up a drawing. Create four new layers with the following properties:

New Layer Names	Color	Style (Linetype)
Steel	Black	Continuous
Dims	Red	Continuous
Hatch	Yellow	Continuous
Hidden	Blue	Hidden

Existing TurboCAD Layers	Meaning
0	The unerasable layer name present in all drawings.
\$CONSTRUCTION	Used for drawing construction lines; does not plot.

2. To create a new layer, click **New**. TurboCAD creates a new layer with the default name of “Layer_1”:



TurboCAD's Drawing Setup dialog box for creating layers

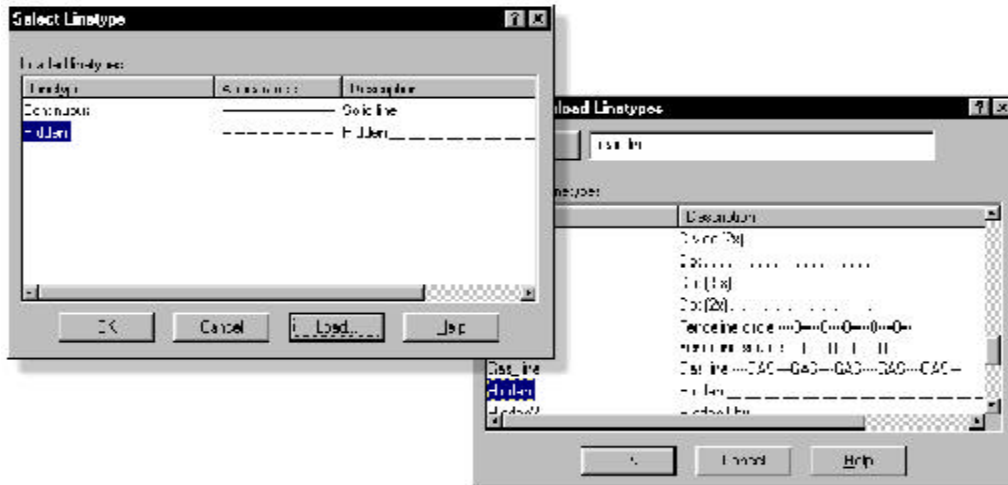
3. Click the “Layer_1” text and replace it with “Steel” and press **Enter**.

- To create layer Dims, click **New** and type “Dims.” To change the color from black to red, click the small black square in the C column (short for “Color”). AutoCAD displays the **Select Color** dialog box:



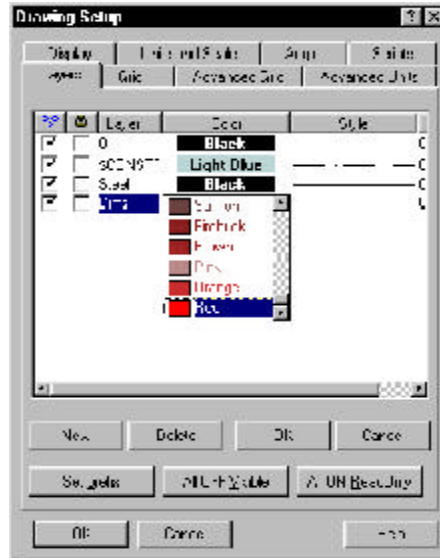
AutoCAD's Select Color dialog box

- Click the red square in the upper left corner, then click **OK**. AutoCAD changes the layer color from black to red. Do the same for layer Hatch, except that you click color yellow.
- After creating layer Hidden, change its color to blue. To change the linetype to Hidden, click the word “Continuous” in the **Linetype** column. AutoCAD displays the **Select Linetype** dialog box:



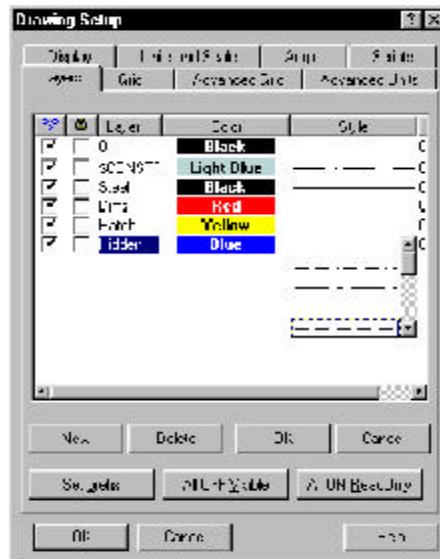
AutoCAD's Select Linetype dialog boxes

- To create layer Dims, click **New** and type “Dims.” To change the color from black to red, click the word “Black” in the **Color** column. TurboCAD displays a drop list of colors:



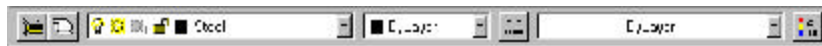
TurboCAD's layer colors

- Scroll to the end of the list and double-click “Red.” TurboCAD changes the layer color from black to red. Do the same for layer Hatch, except that you select color “Yellow.”
- After creating layer Hidden, change its color to blue. To change the linetype to Hidden, click the continuous line in the **Style** (a.k.a. *linetype*) column. TurboCAD displays the linetype drop list:



TurboCAD's layer linetypes

7. No linetypes are loaded in a new AutoCAD drawing, so click the **Load** button. AutoCAD displays the **Load or Reload Linetypes** dialog box. Scroll down and select Hidden and click **OK**. AutoCAD loads the linetype from the Acad.Lin linetype definition file into the drawing.
8. Back in the **Select Linetype** dialog box, click Hidden and **OK**. AutoCAD sets the hidden linetype pattern to the Hidden layer.
9. Finally, click Steel layer and click the **Current** button to set Steel as the working layer.
10. Click **OK** to dismiss the dialog box. Ensure that Steel is the current layer by looking at the **Object Properties** dialog box:



AutoCAD's Object Properties dialog box

Setting the Snap and Grid Spacing

1. To set the drawing modes — ortho, snap, and grid spacing — select **Tools | Drawing Aids** from the menu bar or type the **DdRMODES** command. AutoCAD displays the **Drawing Aids** dialog box:



AutoCAD's Drawing Aids dialog box

2. In the **Modes** section, click the **Ortho** box to constrain the drawing to the 0- and 90-degree axis.
3. In the **Snap** section, click the **On** box to turn on snap mode. Looking at the diagram of the mechanical part, note that you need to draw to the nearest 0.05". For the **X Spacing** type 0.05". Press **Tab** and AutoCAD automatically fills in the **Y Spacing** with the same distance.
4. In the **Grid** section, click the **On** box to display the grid. You want the grid to display every half-inch, so for the **X Spacing** type .5". Press **Tab** and AutoCAD automatically fills in the **Y Spacing**

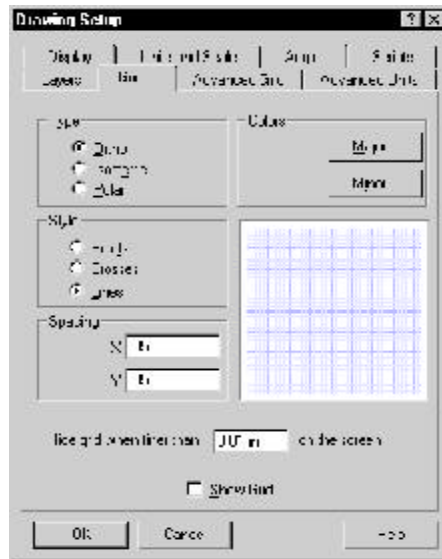
7. All linetypes are loaded in a new TurboCAD drawing but are unnamed. Scroll down and double-click the line style that looks the most like hidden.
8. TurboCAD sets the hidden linetype pattern to the Hidden layer.
9. Click **OK** layer to dismiss the dialog box.
10. To set the Steel layer as the active (a.k.a. *current*) layer, select it from the **Properties** toolbar:



TurboCAD's Properties toolbar

Setting the Snap and Grid Spacing

1. To set the drawing modes — ortho, snap, and grid spacing — select **Options | Grid** from the menu bar to display the **Drawing Setup** dialog box again.
2. Unlike AutoCAD, you don't need to turn on an "ortho" mode. That's because TurboCAD draws in ortho mode any time you hold down the **Shift** key.
3. Looking at the diagram of the mechanical part, notice that you need to draw to the nearest 0.10". In the **Spacing** section, set **X** and **Y** to 0.05". In TurboCAD, this is the snap setting, as well as "minor" grid spacing, as shown by the figure below:



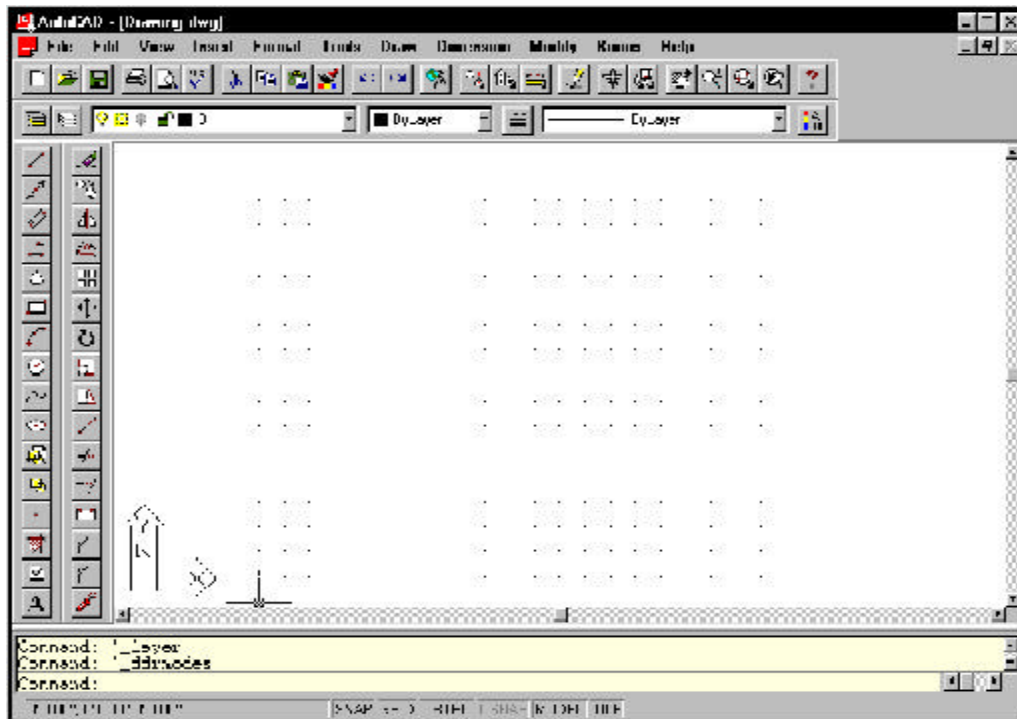
TurboCAD's Grid dialog box

4. To set the "major" grid (a.k.a. *the grid spacing in AutoCAD*), click the **Advanced Grid** tab. You want the major grid to display every half-inch, so for **Minor X and Minor Y Divisions**, type **5**; TurboCAD displays the major grid at five times the spacing of the minor grid.



AutoCAD's Drawing Aids dialog box

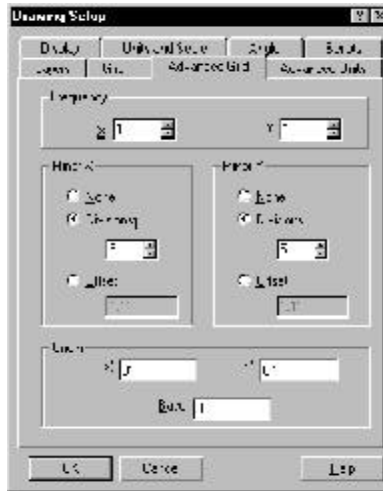
5. You won't be needing an isometric grid, so click **OK** to dismiss the dialog box. AutoCAD displays the grid. Looking at the status line, confirm that SNAP, GRID, and ORTHO are turned on.



AutoCAD drawing with grid turned on

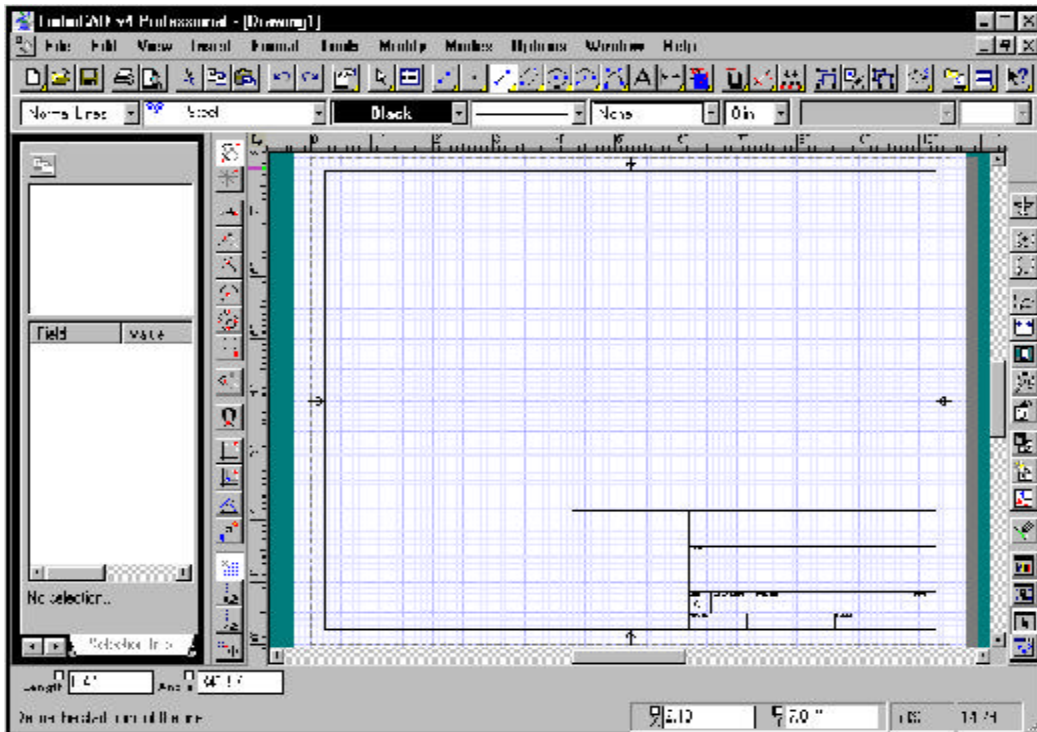
6. Use the **Zoom All** command to ensure you see the entire drawing.

Lesson 1 Setting Up the Drawing



TurboCAD's Advanced Grid dialog box

5. Click **OK** to dismiss the dialog box. TurboCAD displays the two grids in blue (major grid) and light blue (minor grid). Looking at the ruler, confirm the grid spacing.



TurboCAD's drawing with the grid turned on

TurboCAD's Property Toolbar

ENTITY STYLE. Applies predefined property settings to a drawing tool; does not change the properties of selected objects. Create entity styles with the **Format | Properties** command.

PEN COLORS. Selects the pen (a.k.a. *current*) color; as in AutoCAD, color "By Layer" matches the color to the current layer. "By Block" matches the block color.

BRUSH PATTERN (a.k.a. *hatch pattern*): Selects a fill pattern for closed objects; patterns cannot be customized.

TEXT FONT: Selects a font for text (when **Text** tool is selected); all TrueType fonts are available.

TEXT FONT ATTRIBUTES. Sets text Bold, Italic, Underline, or Strikethrough.



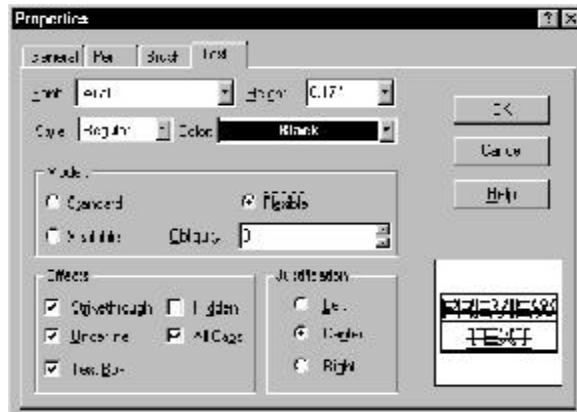
LAYERS. Sets the active (a.k.a. *current*) layer.

PEN STYLE (a.k.a. *linetype*): Selects the style of the line; as in AutoCAD, color "By Layer" matches the line style to the current layer. "By Block" matches the block line style.

PEN WIDTH: Selects the width for any object, unlike in AutoCAD.

TEXT HEIGHT: Sets the height of text (when **Text** tool is selected).

TEXT PLACEMENT. Governs how text is placed: Standard, Text Box, Hidden, Scalable, and Flexible. Additional text settings are available with the **Format | Properties | Text** command.



TurboCAD's Text Properties dialog box

TurboCAD's Layers Property Sheet

LAYER: Name of the layer.
Maximum length = 42 characters.
Maximum number = unlimited layers. The width of the "Layer" can be adjusted wider to read long names.

COLOR: TurboCAD allows 256 colors; all colors are named. Default color = black.

STYLE (a.k.a. linetype): TurboCAD has 12 line styles; no complex (2D) styles; styles cannot be customized.

ORDER (a.k.a. DrawOrder): Determines the order in which layers are drawn. Default = 0; maximum = 100; order 2 overlaps order 1.

CANCEL (or UNDO): Undoes changes.

OK (or APPLY): Applies changes.

NEW: Creates a new layer.

DELETE: Erases a layer without warning.

ALL OFF/ON VISIBLE: Sets all layers to visible — or not visible — at one time.

ALL ON/OFF READ-ONLY: Sets all layers to read-only (a.k.a. *locked*) — or editable (a.k.a. *unlocked*) — at one time.

SET PREFIX: TurboCAD automatically assigns a sequential layer number when you click **OK** without changing the name. In the **Prefix** dialog box, the @ symbol represents the number. Blocks, groups, and symbols can also be auto-named.

Layer	Color	Style
0	Black	1
1	Light Blue	2
2	Black	3
3	Red	4
4	Yellow	5
5	Blue	6



 **NOTE:** To set the active layer, use the **Layers** list box of the **Properties** toolbar.

Saving the Drawing

1. To give the drawing a name, select **File | Save** from the menu bar or type the **SaveAs** command. AutoCAD displays the **Save Drawing As** dialog box.

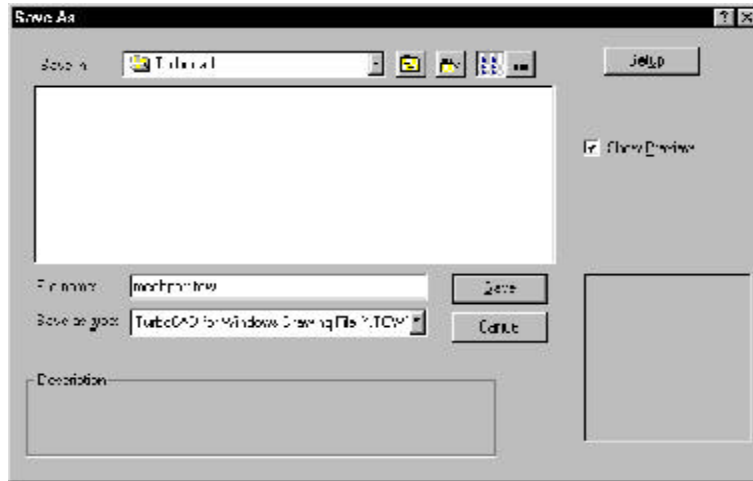


AutoCAD's Save Drawing As dialog box

2. Select a convenient subdirectory (folder) in the **Save In** list box.
3. For the **File Name**, type “Mechpart” and click **OK** to save the drawing.

Saving the Drawing

1. To give the drawing a name, select **File | Save As** from the menu bar. TurboCAD displays the **Save As** dialog box.



TurboCAD's Save Drawing As dialog box

2. Select a convenient subdirectory (folder) in the **Save In** list box.
3. For the **File Name**, type “Mechpart” and click **Save** to save the drawing. TurboCAD displays the **Summary Info** dialog box. Click **OK** to dismiss it and TurboCAD saves the drawing.

Summary

Congratulations! You've set up your new drawing in TurboCAD. Even though the drawing doesn't seem to have anything in it (except a lot of grid lines), it already carries much information.

In this lesson, you learned how to start TurboCAD, set up the drawing parameters, and save the drawing. In the next lesson, you start to draw with TurboCAD. You create the mechanical part with a variety of drawing and editing commands.

At this point, you can exit TurboCAD by selecting **File | Exit** from the menu bar. When you want to continue with Lesson 2, double-click the TurboCAD icon. After TurboCAD starts, load the **MechPart.Tcw** drawing file from the **File** menu.

2

Inserting Objects


Drawing, Editing, and Block Creation

In this lesson, you begin drawing the mechanical part. In TurboCAD, you create a drawing by *inserting* objects, such as rectangles, lines, circles, and arcs. Although you type no commands in TurboCAD, you do type parameter values, such as length and angle. To help you insert objects, you may type coordinates, use relative coordinates, object snaps, and locked values (a.k.a. *point filters*). You also learn how to create and place symbols and blocks.

Starting to Draw

If TurboCAD is not running with the drawing loaded from Lesson 1, start TurboCAD now. When the **New TurboCAD Drawing** dialog box appears, click **Cancel**. Select the drawing name, **Mechpart.TCW**, from the **File** menu.

To draw the mechanical part, we start with the front view in the lower-left corner of the drawing. In TurboCAD, you start every command in one of two different ways:

- Select the command from the menu bar, such as **Insert | Line | Rectangle**.
- Or, click the icon on one of the toolbars, such as 

You do not type command names, as in AutoCAD. However, some commands do have keyboard shortcuts. (See Appendix A for the complete list.)

Unlike AutoCAD, *all* commands automatically repeat until you select another command; there is no need for Multiple command prefix, as in AutoCAD.



NOTE: Drawing commands are found under the **Insert** menu item. Think of it as inserting an object.

Drawing Construction Lines

To make it easier to draw the mechanical part, let's start by placing xlines. We start by placing horizontal construction lines, followed by vertical lines.

1. Turn on **Sn**ap mode to ensure xlines are placed at a precise spacing.
2. Double-click the coordinate display on the status line until it displays relative coordinates, such as 1.23<45.
3. Unlike TurboCAD, there is no need to relocate the origin. We simply start drawing from 0", 0". We position the drawing in paperspace later.
4. Since it is hard to see construction lines when they are the same color as the grid, create a new layer named "Construction" with the color yellow. Unlike TurboCAD, AutoCAD does not automatically place construction lines on their own layer.
5. From the menu bar, select **Draw | Construction Line**. AutoCAD prompts you:
_xline Hor/Ver/Ang/Bisect/Offset/<From point>: **H**
Type **H** to select the **Horizontal** option, and press <Enter>.
6. AutoCAD prompts you:
Through point:
Click at the following y-coordinate positions: 0", 0.5", 2", 3.5", and 5".
7. To draw the vertical construction lines, select **Draw | Construction Line** and type **V** for the **Vertical** option. Click at the following x-coordinate positions to place the vertical construction lines: 0", .75", 1.5", 2.25", 3", 5.5", and 7".

Inserting Construction Lines

To make it easier to draw the mechanical part, start by placing construction lines (a.k.a. *xlines*). Construction lines are infinitely long, are displayed, but are not plotted. TurboCAD's construction lines are automatically placed on layer "\$CONSTRUCTION", drawn in a specific color and pen style (a.k.a. *linetype*).

As in AutoCAD, TurboCAD lets you place vertical, horizontal, and angular construction lines (but not rays). Unlike AutoCAD, TurboCAD can also place construction circles. It is possible to use any object as a construction by setting the layer to \$CONSTRUCTION prior to drawing the object.

Start by placing horizontal construction lines, followed by vertical lines.

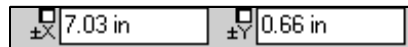


1. Turn on **Grid** snap by clicking its icon. This ensures construction lines are placed at precise grid spacing. Turn on **Show Magnetic Point** (a.k.a. the AutoSnap *magnet*). This forces the cursor to move to the nearest grid point.

Show Magnetic Point icon



2. Select **Relative Coordinates**. This lets you draw from a relocated origin, which we set next.



Coordinate bar in relative mode



3. Click the **Relocate Origin** icon. TurboCAD prompts you, "Define new position for Relative/Polar origin." Notice that the cursor has changed shape to a circle-cross. Watching the Coordinate bar, click at 1.5, 2.5. A red square appears at the new origin. This square only appears when TurboCAD is in relative or polar coordinate mode.



NOTE: The option **Fixed Relative Origin** under menu **Options | Program Setup** force the relocated relative origin to remain in the same position throughout the drawing process. This may be more useful than the normal method, which moves the origin according to the last point drawn.



4. Since it is hard to see construction lines when the grid is turned on, turn off the grid by clicking off the **Show Grid** button. The grid is now like AutoCAD's snap: invisible but activated. (As an alternative, you can change the color of the construction lines by editing its layer properties.)

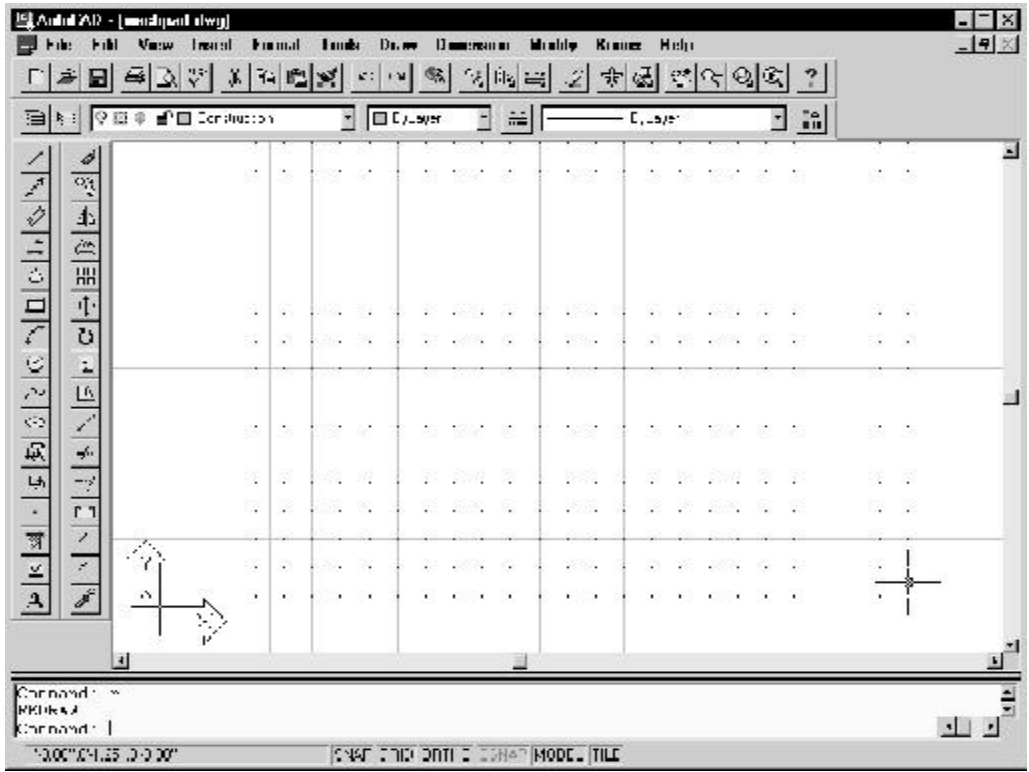


5. From the menu bar, select **Insert | Construction | Horizontal Line**. TurboCAD prompts you, "Define the position of the horizontal construction line."

6. Click at the following y-coordinate positions: 0", 0.5", 2", 3.5", and 5".



7. To draw the vertical construction lines, select **Insert | Construction | Vertical Line**. Click at the following x-coordinate positions to place the vertical construction lines: 0", .75", 1.5", 2.25", 3", 5.5", and 7".



AutoCAD's construction lines

The drawing now contains a grid of construction lines, which will help us quickly place drawing elements, such as rectangles, lines, and circles. Even though AutoCAD has automatic backup, it is a good idea to save the drawing when you complete a portion. Press <Ctrl>+S to save your valuable work.

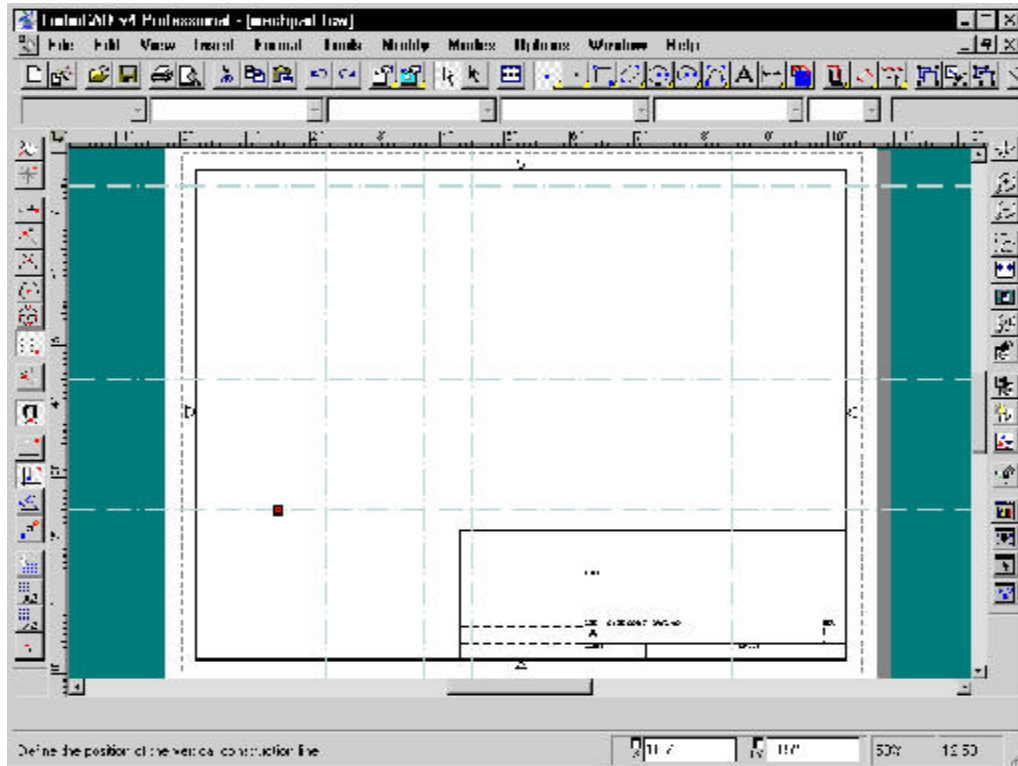
Drawing Rectangles

With the grid of construction lines in place, let's begin drawing the mechanical part by placing rectangles. We'll use two methods to place rectangles by: (1) intersection object snap; and (2) typing coordinates and options.

Intersection Object Snap

The quick and easy way to place rectangles is to snap the corners of the intersection of construction lines.

1. Begin by switching to layer Steel.



TurboCAD's construction lines

The drawing now contains a grid of construction lines, which will help us quickly place drawing elements, such as rectangles, lines, and circles. Even though TurboCAD has automatic backup, it is a good idea to save the drawing when you complete a portion. Press **<Ctrl>+S** to save your valuable work.

Inserting Rectangles

With the grid of construction lines in place, let's begin drawing the mechanical part by placing rectangles. We'll use two methods to place rectangles by: (1) intersection snap; and (2) typing coordinates and parameters.

Intersection Snap

The quick and easy way to place rectangles is to snap the corners to the intersection of construction lines.

1. There is no need to switch to layer Steel, since TurboCAD automatically switches away from layer \$CONSTRUCTION when you select another command.

2. Select **Draw | Rectangle** from the menu bar. AutoCAD prompts you:

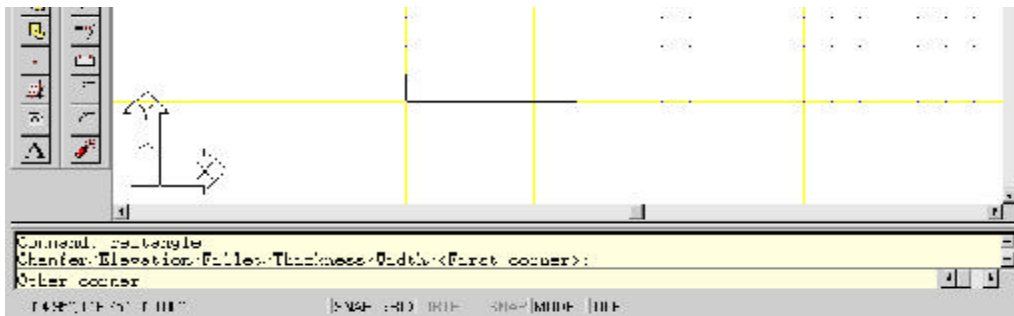
_rectang

Chamfer/Elevation/Fillet/Thickness/Width/<First corner>:

2. Let's change the object snap mode via the cursor menu. While holding down the <Ctrl> key, right-click the mouse button. From the cursor menu, select **Intersection**.

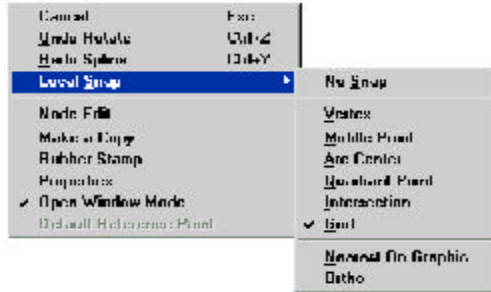


3. With the **Rectang** command still active, move the cursor to the origin 0", 0". Click to define the first corner.
4. Move the cursor to 3", 0.5" by watching the coordinates on the status bar, then click to define the second corner.



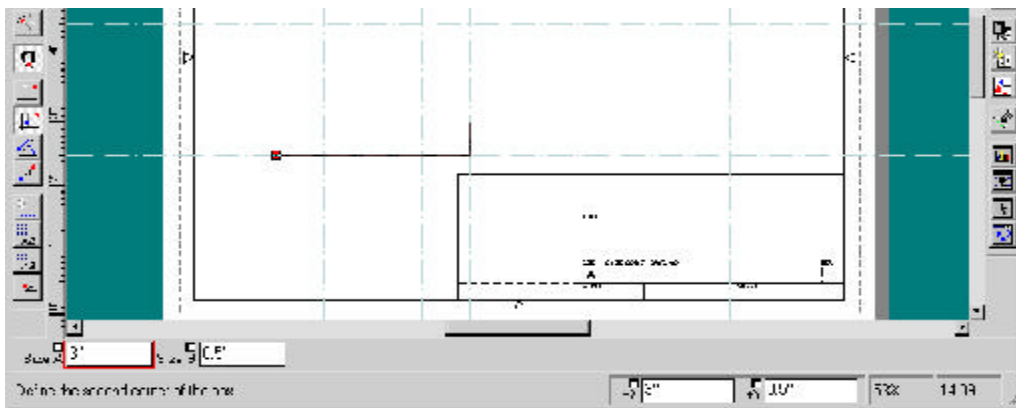
The first rectangle in AutoCAD

1. Begin by selecting **Insert | Line | Rectangle** from the menu bar. Notice that the cursor changes to a cross. TurboCAD prompts you, "Define the first corner of the box."
2. Let's change the snap mode by a different method: the right-click menu, instead of icons on the toolbar. When you right click, TurboCAD displays a context-sensitive local menu (a.k.a. *cursor menu*). From the local menu, select **Local Snap | Intersection**. Or, simply press the letter **I**



TurboCAD's local menu of object snaps

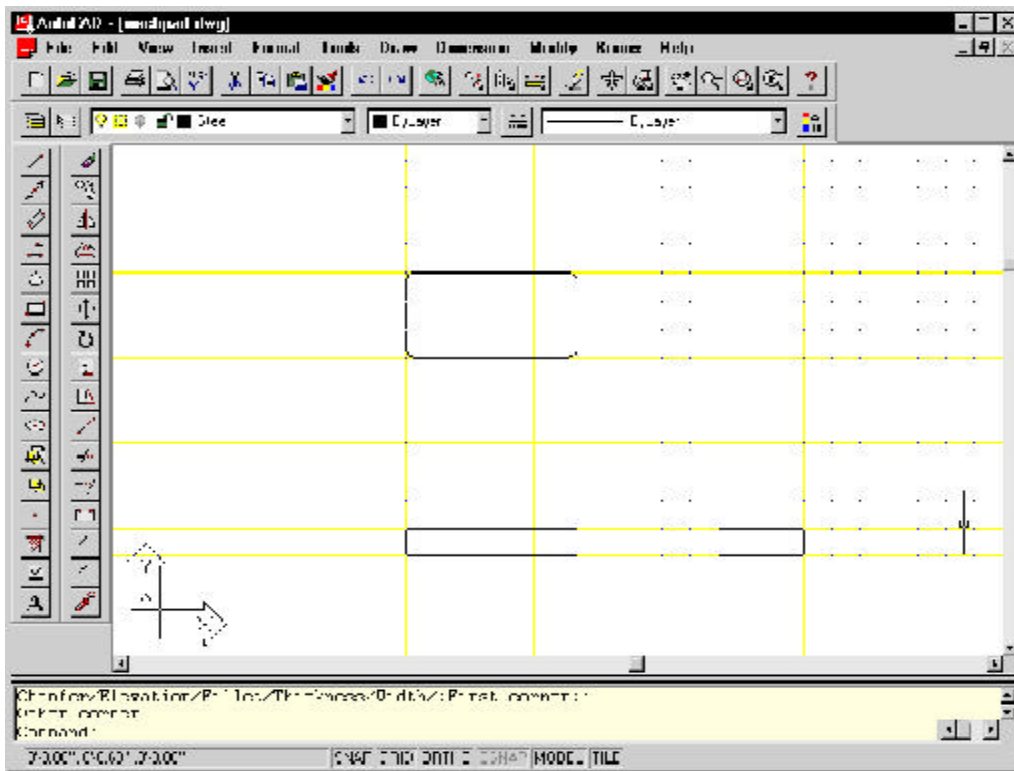
3. With the rectangle command still active, move the cursor to the origin location, the red square at 0",0" in relative coordinates. Click to define the first corner.
4. Move the cursor to 3",0.5" by watching the Coordinate bar, then click to define the second corner. Notice that the Edit bar displays the rectangle's **Size A** (width) as 3" and **Size B** (height) as 0.5".



The first rectangle in TurboCAD

5. Draw two more rectangles by following the figure to see the pick points, as shown on the TurboCAD side. Since the second rectangle has all four corners filleted, we can use the **Fillet** option of the **Rectang** command to place a filleted rectangle:

```
Command: rectang  
Chamfer/Elevation/Fillet/Thickness/Width/<First corner>: f  
Fillet radius for rectangles <0'-0.00">: .125  
Chamfer/Elevation/Fillet/Thickness/Width/<First corner>: <pick>  
Other corner: <pick>
```

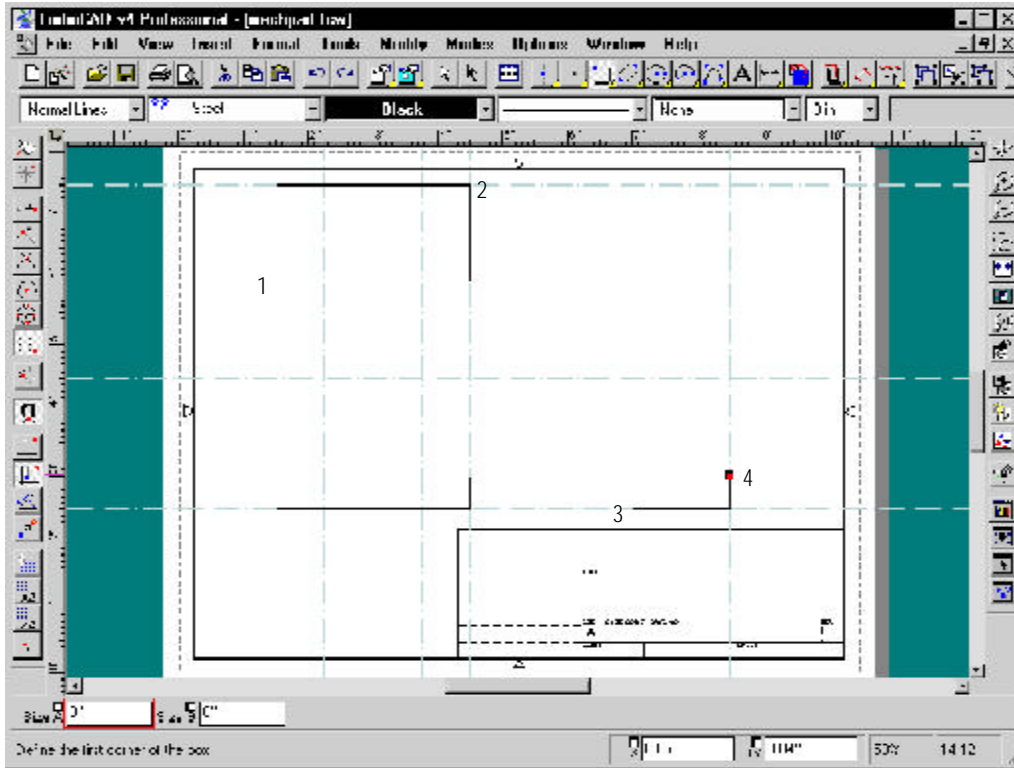


Three rectangles in AutoCAD

5. Draw two more rectangles by following the figure to see the pick points.

Rectangle	Size	Pick Points
First rectangle	3" x 0.5"	...
Second rectangle	1.5" x 3"	1 and 2
Third rectangle	0.5" x 1.5"	3 and 4

If, at any time, you make an error during a command, press the <Esc> key; this is just like pressing <Esc> in AutoCAD to cancel a command. To undo previous command(s), press <Ctrl>+Z or select **Edit | Undo** from the menu bar. As in AutoCAD, you can undo all the way back to the beginning of the editing session.



All three rectangles in TurboCAD

Typing Coordinates and Parameters

In drawing the first three rectangles, we used INTersection object snap with the xlines. When a rectangle needs to be placed where no construction line exists, you could draw more construction lines. The drawback is that too many construction lines make the drawing too complex. We'll type coordinates to precisely place two more rectangles.

1. Double-click the coordinates on the status line to switch to absolute coordinate mode.
2. Start the **Rectang** command again:

Command: **rectang**

Chamfer/Elevation/Fillet/Thickness/Width/<First corner>: **2.25,6.5**

3. That fixes the lower-right corner of the rectangle. Since AutoCAD does *not* let you define the size of the rectangle, type the x,y-coordinates for the other corner:

Other corner: **3.75,7.0**

That creates the fourth rectangle.

4. Use the same method to place the final rectangle. Use x,y-coordinates of **7.5, 3** for one corner and **8, 5.25** for the other corner.

Typing Coordinates and Parameters

Note that when you start the rectangle command, TurboCAD customizes three areas for the command in progress: (1) Properties toolbar; (2) Edit bar; and (3) status line. For the rectangle command, TurboCAD turns on all properties, except those relating to text; displays Size A and Size B on the Edit bar; and prompts you “Define the first corner of the box” on the status line.

To draw the first three rectangles, we used intersection snap with the construction lines. When a rectangle needs to be placed where no construction line exists, you could draw more construction lines. The drawback is that too many construction lines make the drawing too complex.

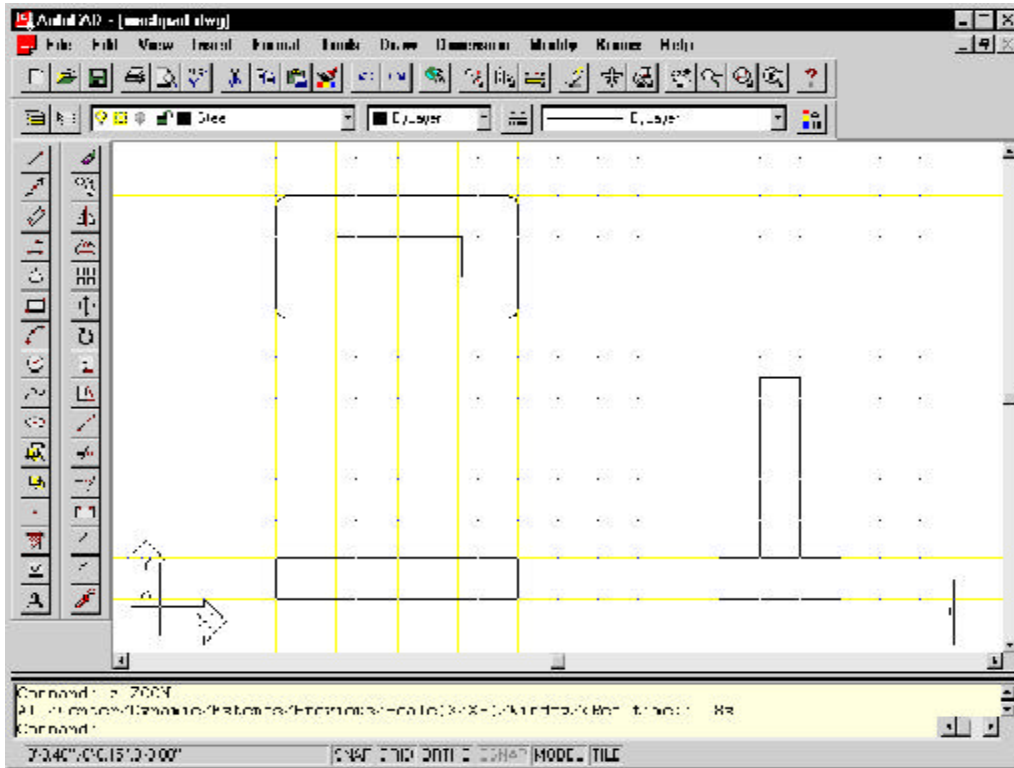
For this reason, let’s use the Edit bar and the Coordinate fields to precisely place two more rectangles.



1. Switch to **Absolute Coordinate** mode and turn off **Grid** snapmode.
2. With the rectangle command still active, press **<Ctrl>+R** to enter the Coordinate bar, as follows:
 X: **2.25"** and press **<Tab>**.
 Y: **6.5"** and press **<Enter>**.

You don’t have to type the inch symbol if you don’t want to. TurboCAD automatically uses the default unit set in Units and Scale.

3. That fixes the lower-right corner of the rectangle. To define the size of the rectangle, press **<Tab>** to enter the Edit bar, as follows:
 Size A: **1.5"** and press **<Tab>**.
 Size B: **0.5"** and press **<Enter>**.
 That creates a fourth rectangle.
4. Use the same method to place the final rectangle:
 Step 1: Press **<Ctrl>+R**.
 Step 2: X= **7.5"** and press **<Tab>**.
 Step 3: Y= **3"** and press **<Enter>**.
 Step 4: Press **<Tab>**.
 Step 5: Size A= **0.5"** and press **<Tab>**.
 Step 6: Size B= **2.25"** and press **<Enter>**.



Five rectangles in AutoCAD

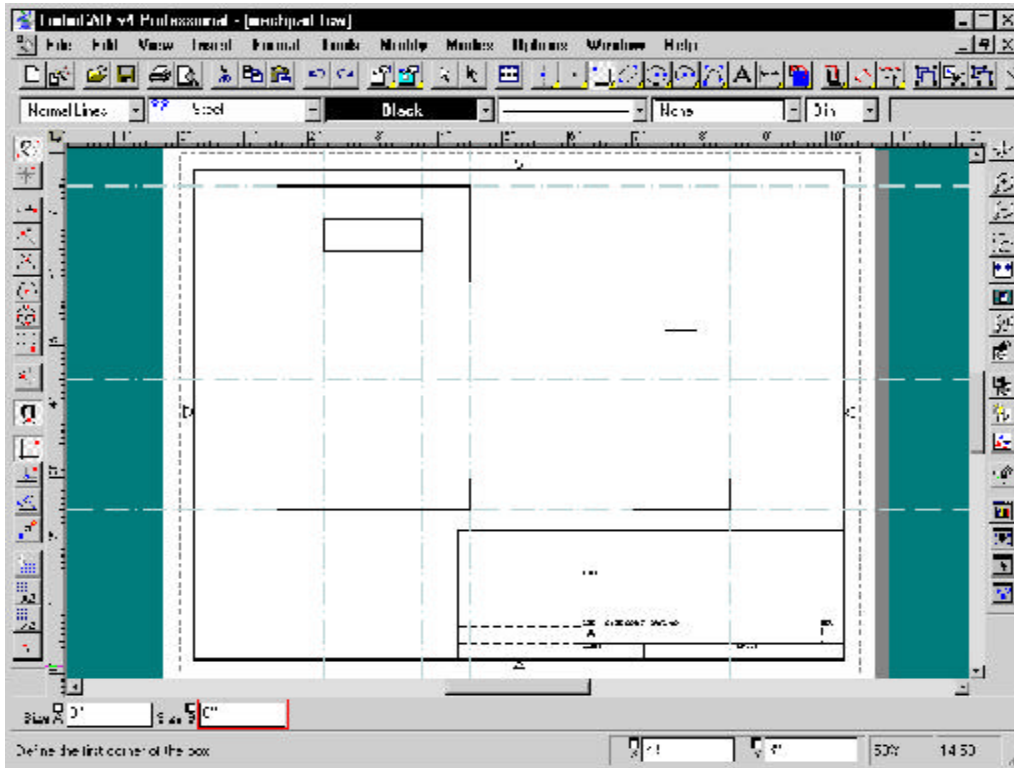
Drawing Circles

With the basic outline formed by rectangles, we can go on to place circles.

1. Our drawing has a pair of concentric circles, so we'll have to use the **Circle** command twice.
select from the menu **Draw | Circle | Center, Radius**.
2. Turn on **INTersection** object snap.
3. Pick at the intersection of the xlines at 1.5", 2".
4. AutoCAD prompts:

```
_circle 3P/2P/TTR/<Center point>: int  
of <pick at the intersepction of 1.5,2>  
Diameter/<Radius>: .25
```
5. Press **<Enter>** to repeat the **Circle** command.

```
_circle 3P/2P/TTR/<Center point>: int  
of <pick the same intersepction>
```



Five rectangles in TurboCAD

Inserting Circles

With the basic outline formed by rectangles, we can go on to place circles.



1. Since our drawing has a pair of concentric circles, select from the menu **Insert | Circle/Ellipse | Concentric**. TurboCAD prompts you, "Define the center point of the circles."



2. Select the **Intersection** snap icon.

3. Pick at the intersection of 3", 4.5".

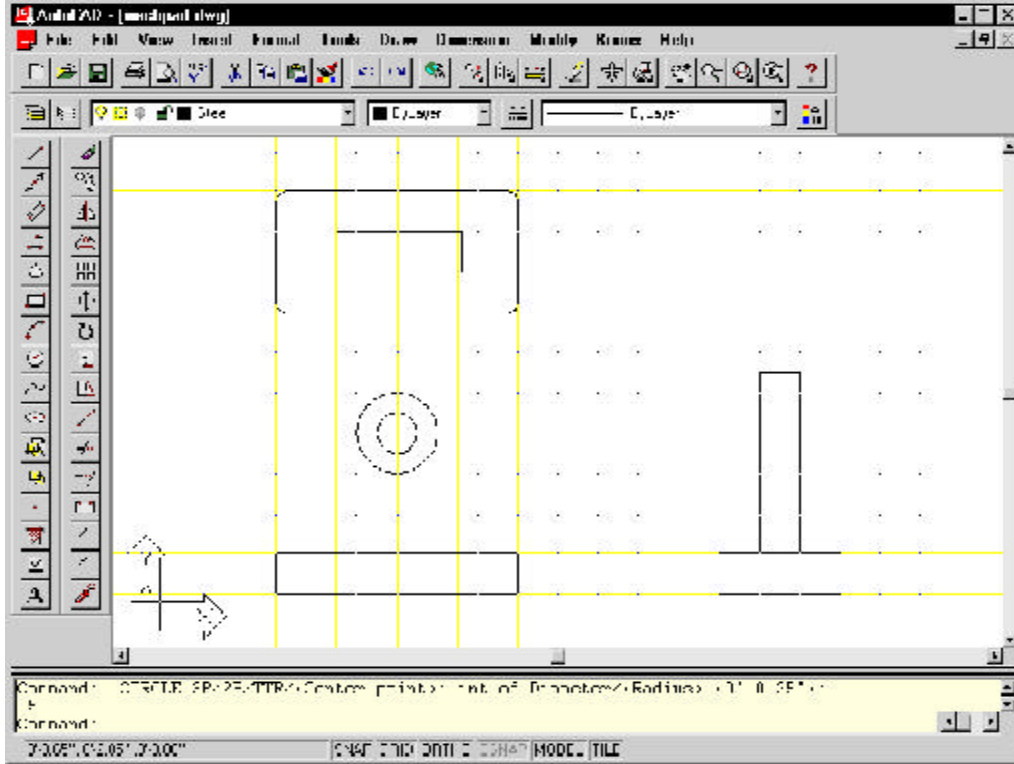
4. TurboCAD prompts, "Define the radius of the circle." Press **<Tab>** to specify **Radius** of 0.25" for the first circle. Notice that TurboCAD allows you to specify a circle by the length of its circumference, something not available in AutoCAD.

5. Press **<Enter>**. TurboCAD draws the circle, then prompts you again for the radius of the circle.

6. Enter **0.5"** for the **Radius**. AutoCAD draws the second circle.

Diameter/<Radius>: 0.5

7. Save your drawing with **<Ctrl>+S**.



Copying and Mirroring Entities








The top view has four bolt holes. The obvious way to draw them is to place one circle, then copy it three times.

1. Insert a circle with center at **0.375"**, **4.625"** with radius **0.125"**.
2. There is no need to switch to **Select** mode (as in TurboCAD) because AutoCAD always reverts to select mode after a command.
3. Click the circle you just completed. It turns dashed and is surrounded by five blue squares.
4. Select **Modify | Copy** from the menu bar. AutoCAD prompts you:
_copy 1 found
<Base point or displacement>/Multiple:
5. Type **2.25<0**.

6. Press <Tab> and enter 0.5" for the **Radius**. TurboCAD draws the second circle.
7. Save your drawing with <Ctrl>+S.

See the figure on the AutoCAD side for the result.

TurboCAD has seven ways to place a circle, as found under the **Insert | Circle/Ellipse** menu selection. Contrasted with AutoCAD, these are:

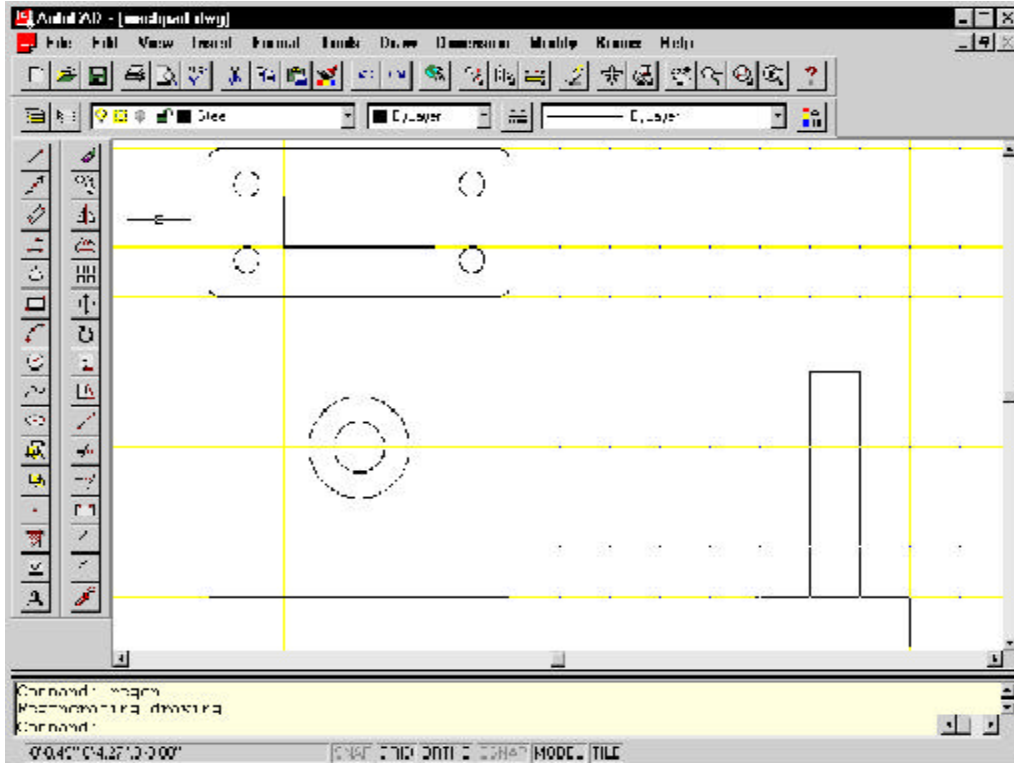
	TurboCAD Circle Commands	AutoCAD Circle Options
	Center and Point	Center and Radius
	Concentric	...
	Double Point	2P
	Tangent to Arc	use the TANgent object snap
	Tangent to Line	use the TANgent object snap
	TriplePoint	3P
	Tangent to 3 Arcs	TTR
...	...	Center and Diameter

Copying and Mirroring Entities

The top view has four bolt holes. The best way to create them is to insert one circle, then copy it three times.

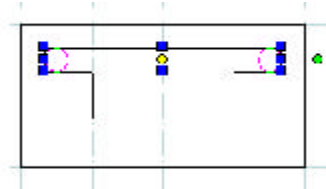
1. Insert a circle at **1.875"**, **7.125"** with radius **0.125"**.
2. From the toolbar, click the **Select** icon. The cursor changes to the standard Windows pointer arrow.
3. Click the circle you just completed. It turns pink and is surrounded by eight blue squares.
4. Select **Edit | Copy Entities | Linear** from the menu bar. TurboCAD prompts you, "Define the step position of the reference point."
5. Press <Tab> four times to change **XStep** from 0" to 2.25"; ensure **Rotation** = 0 and **YStep** = 0".

6. Press <Enter> and AutoCAD copies the circle.
7. To place the two lower bolt holes, we'll use the **Mirror** command. Select the first bolt hole, then hold down the <Shift> key while selecting the second bolt hole.
8. Select **Modify | Mirror** from the menu bar. AutoCAD prompts you:
_mirror 2 found
First point of mirror line:
 9. Turn on **MIDpoint** object snap.
 - 10 Click the midpoint of the vertical line, as indicated by the figure below.
 11. At the "Second point" prompt, click the other vertical line. When AutoCAD asks, "Delete old objects?", answer N. AutoCAD inserts the lower two bolt holes. There is no need to press <Esc> to remove the selection set.



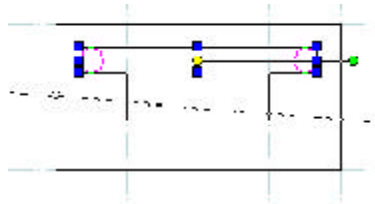
AutoCAD drawing with four holes

6. Press <Enter> and TurboCAD copies the circle. Press <Esc> twice to remove the selection box.
7. To place the two lower bolt holes, let's use the mirror command. Select the first bolt hole, then hold down the <Shift> key while selecting the second bolt hole.



Press <Shift> to add to the selection set

8. Select **Edit | Copy Entities | Mirror** from the menu bar. TurboCAD prompts you, "Define the first point of the mirror line."
9. Turn off **Grid** snap and turn on **Middle Point** object snap. (Or, it is far quicker in TurboCAD to press the **M** key for Middle Point snap, than to change the snap modes all the time.)
10. Click the midpoint of the vertical line, as indicated by the figure below. (Or, move the cursor onto the line and then press **M**. That snaps to the middle of the line without clicking the mouse.)

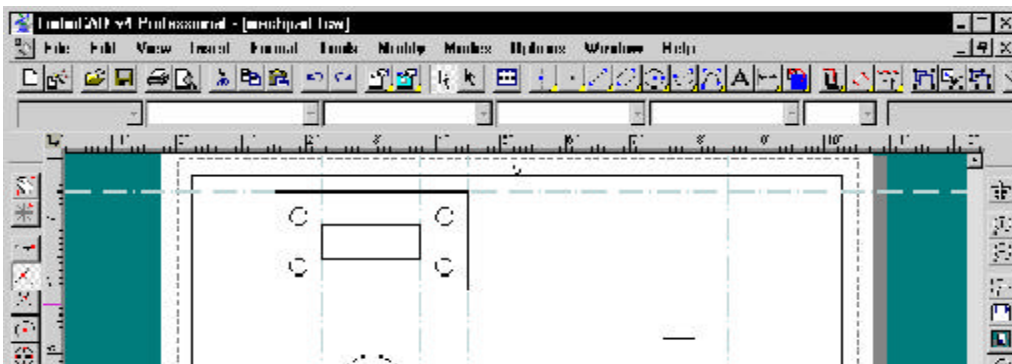


Mirror the selected holes

11. At the "Define the second point of the mirror" prompt, click the other vertical line. TurboCAD inserts the lower two bolt holes. Press <Esc> to remove the selection box (a.k.a. selection set).



NOTE: The original selection stays selected. To perform a mirror — rather than a mirror copy — press to remove the original selection.



TurboCAD drawing with four holes

Drawing Arcs

We finish off the rounded portion of the mechanical part by placing an arc. To draw the arc, we use the SCE method, as follows:

1. Select **Draw | Arc | Start, Center, End** from the menu bar.
2. AutoCAD prompts you to indicate the arc's starting point:

```
_arc Center/<Start point>: int  
of <click at the intersection of xlines at 2.5", 2.0">
```

3. At the next prompt, specify the arc's center:

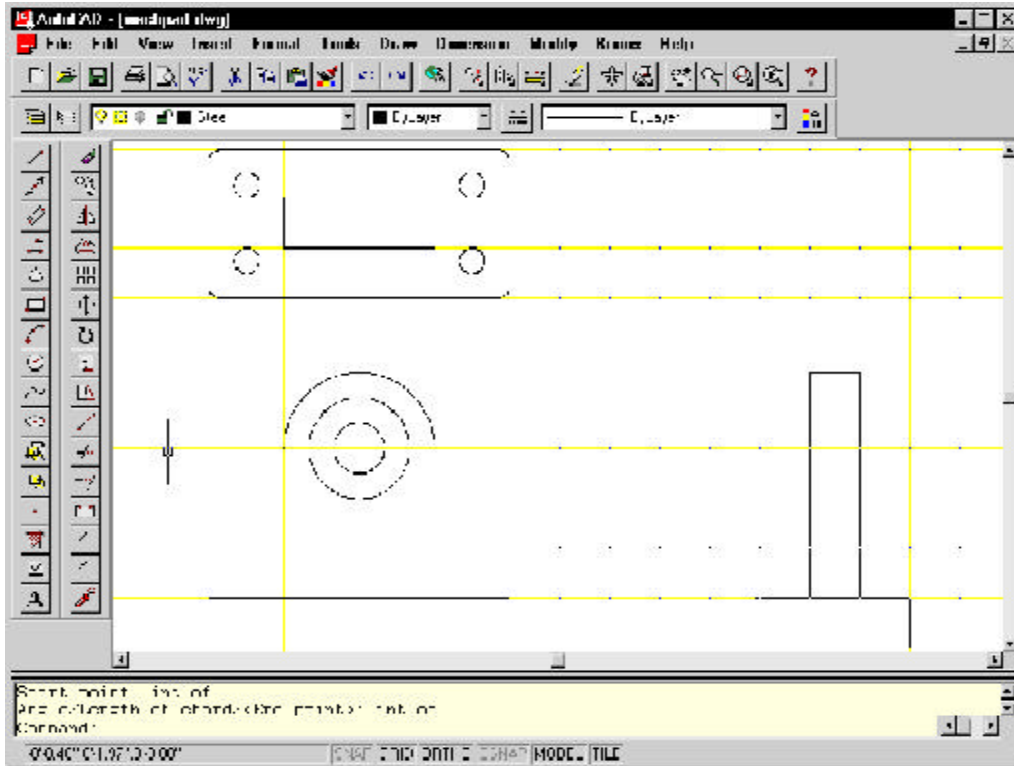
```
Center/End/<Second point>: _c Center: int  
of <click at the intersection of xlines at 1.5", 2.0">
```

Notice that AutoCAD draws an arc. You now complete the definition of the arc by specifying the end point.

4. AutoCAD prompts you to complete the arc:

```
Angle/Length of chord/<End point>: int  
of <click at the intersection of xlines at .75", 2.0">
```

Like TurboCAD, AutoCAD draws arcs in the counterclockwise direction.



AutoCAD drawing with arc

Inserting Arcs

We finish off the rounded portion of the mechanical part by placing an arc. TurboCAD has eight ways to draw an arc, as shown by the **Insert | Arc** menu selection. It is difficult to compare TurboCAD's eight methods with AutoCAD, since TurboCAD uses different methodology. In AutoCAD, you draw most arcs by specifying a start, center, and/or end point; in TurboCAD, you usually define the start and end angles, instead. To draw the arc, we use the double-point method, as follows:

1. Select **Insert | Arc | Double Point** from the menu bar. Notice that the Edit bar lets you specify the diameter, circumference, angle, start angle, end angle, and length.
2. TurboCAD prompts you, "Define the first point on the arc or circle." Ensuring **Intersection** snap is turned on, click at the intersection of construction lines at 2.25", 4.5".
3. At the "Define a second point on the arc or circle's circumference" prompt, click at the intersection of construction lines at 3.75", 4.5". Notice that TurboCAD draws a circle. You now define the arc by specifying the starting and ending angles.



TurboCAD's arc starts as a circle

4. TurboCAD prompts you, "Define the start angle of the arc." Like AutoCAD, TurboCAD draws arcs in the counterclockwise direction, so click at the same point 3.75", 4.5".



Specifying the angle of the arc

5. At the "Define the end angle of the arc" prompt, click at the first point, 2.25", 4.5". As you move the cursor, notice how TurboCAD sweeps the arc. When you click, the arc is complete.

Drawing Lines

To connect the arc with the base rectangle, we use the **Line** command.

1. Select **Draw | Line** from the menu bar:

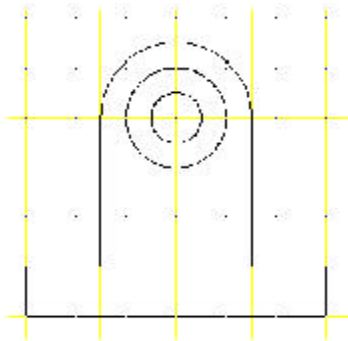
```
_line From point: <pick the endpoint of the arc you just drew>
```

2. Complete the line when AutoCAD prompts:

```
To point: 1.5<270
```

3. Repeat for the second line connecting the arc's other endpoint.

At this point, the new part of your drawing should look like the figure below. Save your drawing.



Adding vertical lines

Filleting Corners

The base of our mechanical part has a 1/8" fillet on all top corners. Earlier, we drew a rectangle with fillets at all four corners. Here we fillet the two remaining rectangles with the **Fillet** command.

1. Filleting works best when object snap mode is set to **NEArest**. Since the two remaining (unfilleted) are polylines, they need to be exploded before you can fillet just two corners. Use the **Explode** command now.

2. From the menu bar, select **Modify | Fillet**.

```
_fillet  
(TRIM mode) Current fillet radius = 0'-0.50"  
Polyline/Radius/Trim/<Select first object>: r
```

3. Type **R** to change the radius from 0.5" to **0.125"**:

```
Enter fillet radius <0'-0.50">: 0.125
```

4. Press **<Enter>** to repeat the **Fillet** command:

```
_fillet  
(TRIM mode) Current fillet radius = 0'-0.13"  
Polyline/Radius/Trim/<Select first object>: <pick one line>
```

Inserting Lines

To connect the arc with the base, we use the line command.

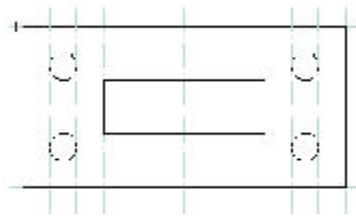
1. Select **Insert | Line | Single** from the menu bar. TurboCAD prompts you, "Define the start point of the line." Pick the endpoint of the arc you just drew. (Or, press the **V** key for Vertex snap.)
2. When TurboCAD prompts, "Define the end point of the line," move the cursor straight down to connect with the base. (If you prefer, you can type **1.5"** in Length and **270** in Angle.)
3. Repeat for the second line connecting the arc's other endpoint.

At this point, your drawing should look like the figure on the AutoCAD side. Save your drawing.

Filleting Corners

The base of our mechanical part has a 1/8" fillet on all top corners. That means we apply the fillet command eight times: four in the top view and twice on each of the front and side views.

1. This command works best when snap mode is set to **Nearest on Graphic**. Click the icon or right-click to display the local menu. [fig of nearest icon]
2. From the menu bar, select **Modify | Fillet**.
3. Press **<Tab>** to change the **Radius** from 1" to 0.125".
4. TurboCAD prompts you, "Select the first entity." Click one line, as shown in the figure.



Selecting the first entity for filleting

5. At the “Select second point” prompt, click an adjacent line. AutoCAD applies the fillet.
6. Continue filleting corners, three more times, as shown in the figure on the TurboCAD side. Save your work.



Notes on TurboCAD View Commands

To get a closer view of what you are working on, you may find that these two of TurboCAD's icons are the most useful:



The **Zoom Window** icon works exactly like AutoCAD's Zoom Window command. Pick two points and TurboCAD zooms into that rectangle.

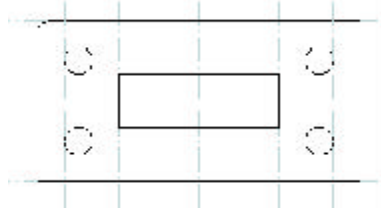


The **Zoom Extents** icon displays the entire drawing, as in AutoCAD. The keyboard shortcut for zoom extents is **<Ctrl>+<Backspace>**.

While you may find that these are the only two zoom commands you ever need, you might be interested in knowing about TurboCAD's other zoom commands found in **View | Zoom** on the menu bar:

TurboCAD Command	TurboCAD Shortcut Key	Equivalent AutoCAD Command
Zoom In	+	Zoom 2x
Zoom Out	-	Zoom 0.5x
Zoom Window	...	Zoom Window
Extents	<Ctrl>+<Backspace>	Zoom Extents
Full View	<Shift>+<Backspace>	Zoom All
Printed Size	...	Preview
Aerial View	...	DsViewer
Previous View	...	Zoom Previous
Pan to Cursor	<Ctrl>+<End>	Pan

- At the “Select the second entity” prompt, click an adjacent line. TurboCAD applies the fillet.

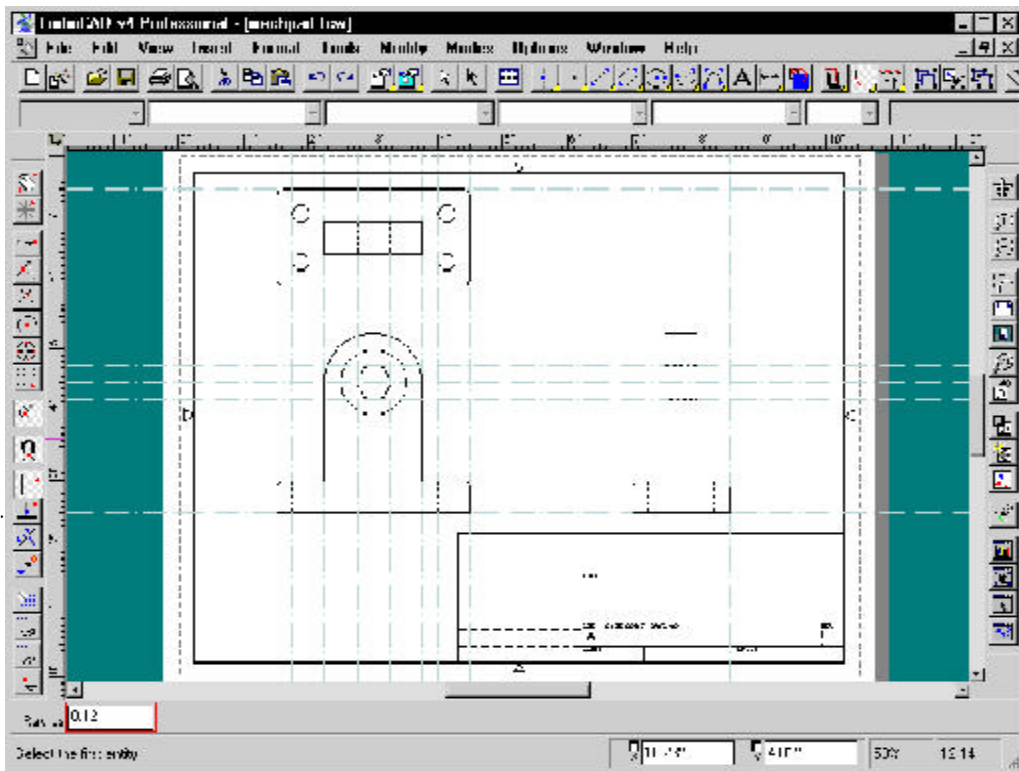


caption

- Continue filleting corners, seven more times, as shown in the figure. Notice how quick the filleting process is (as contrasted with AutoCAD) since TurboCAD automatically repeats the fillet command. Save your work.



NOTE: For multilines you can fillet all the corners at once. Select the first line segment, then from the local menu choose *Multiline*.

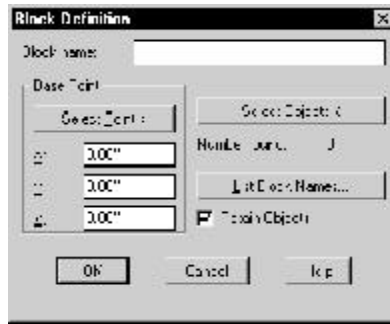


Completed fillets

Making and Inserting Blocks

Our mechanical part has a round bearing surface. Since this appears four times in the drawing, we will create it as a block, then place the block in the drawing.

1. Ensure the layer is **Steel**, the linetype is **Continuous**. Add more xlines, if you think you will find them helpful.
2. Draw the 0.1" thick bushing face with the **Draw | Polyline**.
3. To end the **Polyline** command, press **<Enter>**.
4. To create the block, click on the polyline. AutoCAD highlights it with handles.
5. From the menu bar, select **Draw | Block | Make**. The **Block Definition** dialog box appears.



AutoCAD's Block Definition dialog box

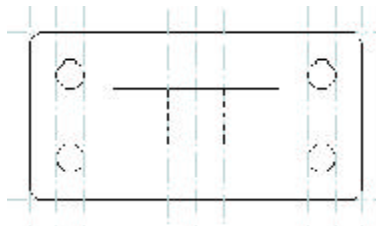
Creating and Placing Blocks

Our mechanical part has a round bearing surface. Since this appears four times in the drawing, we will create it as a block, then place the block in the drawing. TurboCAD has three forms of grouping objects together — in contrast with AutoCAD's two:

TurboCAD	AutoCAD Equivalent
Symbol	...
Block	Block
Group	Group

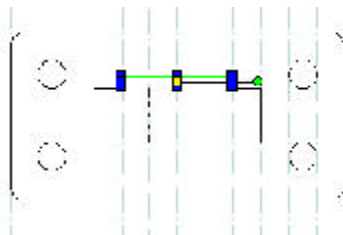
A *symbol* differs from a *block* in these two ways: (1) it can be stored on disk in any file format, whereas a block cannot because it is an integrated part of the active drawing; and (2) each time a symbol is placed, it is copied, whereas a block is referenced.

1. Turn on **Grid** snap. Set the entity style to “Normal Lines”; ensure the layer is “Steel”; the linetype is “Continuous.” Add more construction lines, if you find them helpful.
2. Draw the 0.1" thick bushing face with the **Insert | Line | Multiline**. Despite the similarity in name, TurboCAD's multiline is nothing like AutoCAD's multiline; rather is more like a polyline: a series of connected line segments that act as a single object.
3. To end the multiline command, right click and select **Finish** from the local menu.



caption

4. To create the block, click the **Select** icon. Select the multiline that you just drew. TurboCAD highlights it with handles. (Or, press the **F7** key, which is a shortcut for select last object.)



caption

5. From the menu bar, select **Format | Create Block**. The bushing disappears. You can also drag the selection by the reference point into the block palette.

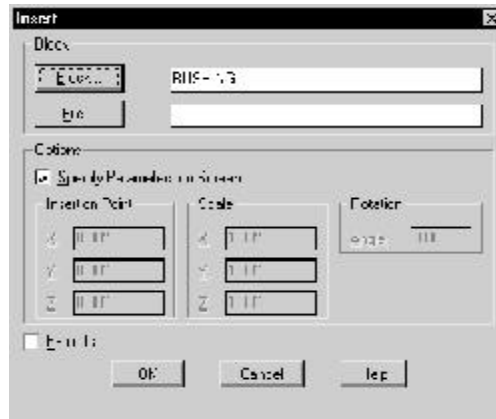
6. To make it easier to place the block, change the base point. Click the **Select Point** dialog box. The dialog box disappears and AutoCAD prompts:
`_bmake Insertion base point: <pick the MIDpoint of the polyline>`
7. To give a name to the block, type the name “Bushing” for **Block Name**. Ensure **Retain Objects** is turned off. Click **OK**.
8. To place the block, select **Insert | Block**. When the **Insert** dialog box appears, click the **Block** button.



AutoCAD's Defined Blocks dialog box

From the **Defined Blocks** dialog box, select “Bushing” and click **OK** twice. AutoCAD prompts:

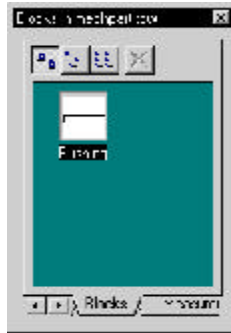
```
_ddinsert Insertion point: <pick>  
X scale factor <1>/Corner/XYZ: <Enter>  
Y scale factor (default = X): <Enter>  
Rotation angle <0>: <Enter>
```



AutoCAD's Insert dialog box



- To see the bushing block, click the **Blocks** icon. This displays the blocks palette. When the palette appears, notice that TurboCAD automatically gave the block the name of “Block_0.”

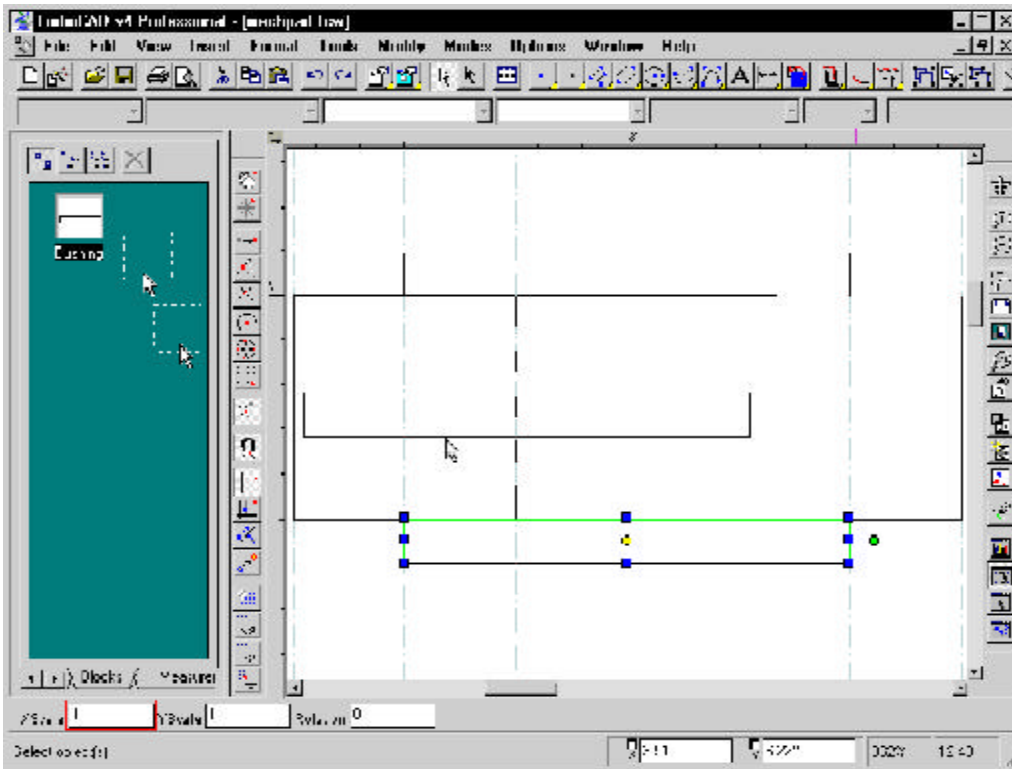


TurboCAD's Blocks palette



TIP: You can change the automatic name that TurboCAD gives blocks, groups, and symbols with the **Options / Auto-Naming** command. The **Program Setup** dialog box displays the **Auto-Naming** tab.

- To change the name of the block, double-click the block and TurboCAD displays the **Edit Block** dialog box. Change the **Name** to “Bushing” and click OK.
- Place the block by dragging it from the palette into the drawing. Ensure **Vertex** snap is turned on.



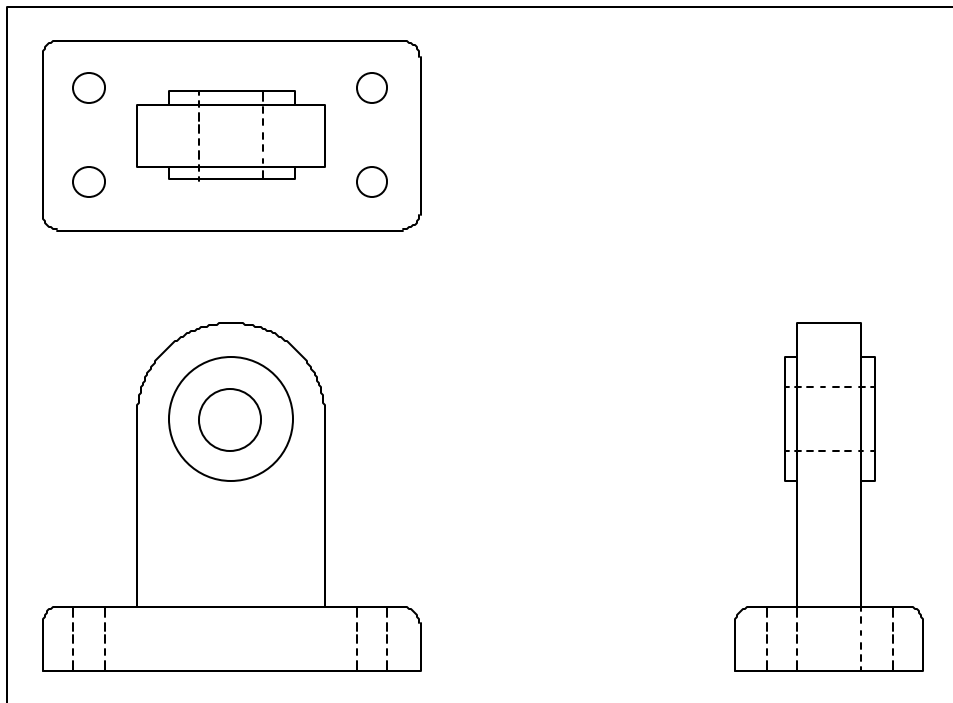
Dragging a block from the Blocks palette into the drawing

9. Place the block three more times. When required, use the **Rotation** parameter to rotate the block by 90, 180, or 270 degrees. Save your work.

Changing Linetypes and Layers

The holes in the mechanical part show up as hidden lines in all three views. Let's first draw the hidden line in the top view.

1. Place a pair of xlines on layer **Construction** to help draw the hidden lines, as shown in the figure on the TurboCAD side. Use **INTersection** object snap to place the lines accurately.
2. On the Object Properties toolbar, select layer **Hidden** and ensure linetype **Hidden** is selected.
3. Select **Draw | Line** and draw the two hidden lines, as shown in the figure on the TurboCAD side.



Mechpart drawing with hidden lines

- Place the block three more times. When required, use the **Rotation** parameter on the Edit bar to rotate the block by 90 degrees. Alternatively, use the rotation handle and hold down the **<Shift>** key to rotate the block in 90-degree increments. Save your work.

Changing Linetypes and Layers

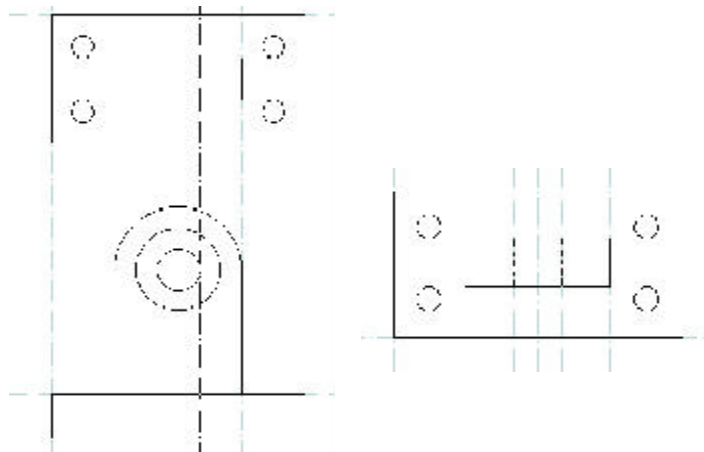
The holes in the mechanical part show up as hidden lines in all three views. Let's first draw the hidden line in the top view. Later, we create an entity style to help automate the process.

- On the **Properties** toolbar, select layer Hidden and linetype hidden (looks like a short dashed line).



TurboCAD's Property toolbar

- Place a pair of construction lines to help draw the hidden lines, as shown in the figure below. Remember to use **Intersection** snap to place the lines accurately. Note how the construction lines retain their own properties; they do not take on the properties you set above in step 1.



Placing additional construction lines (left) and adding hidden lines (right)

- Ensure the **Line** tool is still selected and draw the two hidden lines, as shown in the figure.



NOTE: Holding down the **<Shift>** key while drawing a line forces it to be drawn horizontally or vertically.

TurboCAD's Entity Styles

In AutoCAD, you can create named objects for views, fonts, layers, and so on. These named objects (a.k.a. *tables*) predefine viewpoints, text styles, layer properties, etc. TurboCAD takes that concept a step further by allowing you to create *styles* for entities. Just like styles in a word processor, TurboCAD's entity styles predefine the properties of objects.

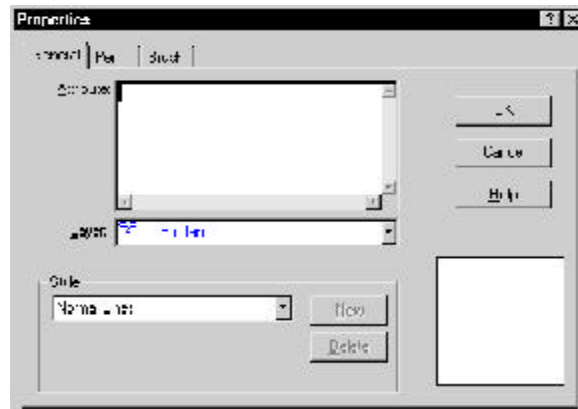
Entity styles are independent of layer settings. Unfortunately, you cannot apply a style to selected objects, nor can you define a style from a selection set.

You create entity styles with the **Properties** dialog box in four steps: (1) set the properties; (2) click the **Style** list box; (3) type the style name; and (4) click **New**. TurboCAD adds the style to the **Properties** toolbar and makes it the default.

General Tab

The **General** tab lets you set the following properties:

- **Attribute**, any sort of text you would like included with the object (a.k.a. *extended entity data*).
- **Layer** lets you select one of the layers you defined previously.
- **Style** lets you create a new style name by simply typing the name in the text box.
- **New** creates a new style (*not* clicking **New** renames the style).
- **Delete** removes the style from TurboCAD's list.

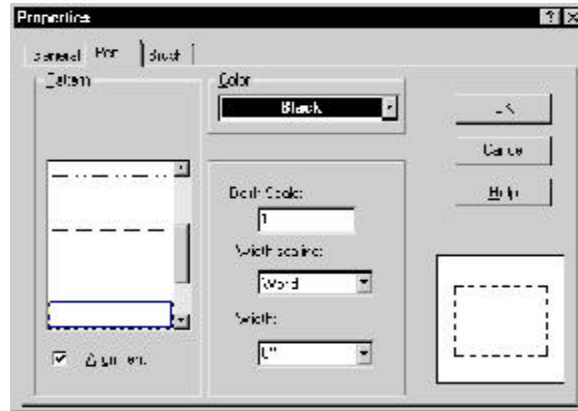


General tab of the Properties dialog box

Pen Tab

The **Pen** tab sets the color and pattern (a.k.a. *linetype*) of objects:

- **Dash Scale** is equivalent to AutoCAD's linetype scale.
- **Width** allows you to give width to any object (unlike AutoCAD) using world (absolute) or device (relative) scaling.
- **Preview** box lets you see the effects as you apply them.

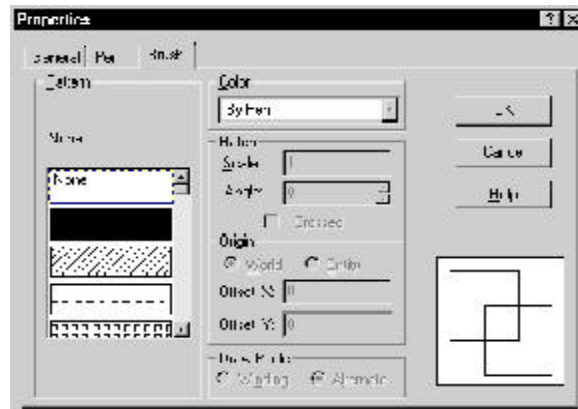


The Pen tab of the Properties dialog box

Brush Tab

The **Brush** tab sets the hatch pattern parameters:

- Switch **Pattern** between **None** and **Solid** is the equivalent to turning Fill off and on in AutoCAD.
- **Draw Mode** is similar to AutoCAD's boundary style.



The Brush tab of the Properties dialog box

Summary

Congratulations! In this lesson, you did a lot of drafting. You inserted rectangles, circles, arcs, lines, and multilines. You used TurboCAD's snaps, edit bar, and coordinate bar. You learned how to create entity styles and blocks.

In the next lesson, you will learn how to dimension with TurboCAD, place text, and plot the drawing.

At this point, you can exit TurboCAD by selecting **File | Exit** from the menu bar. When you want to continue with the next lesson, double-click the TurboCAD icon. After TurboCAD starts, open the **MechPart** drawing.

3

Applying the Finishing Touches

Dimensioning, Paper Space, Text, and Plotting

In this lesson, we apply the finishing touches to the mechanical part drawing.

Topics in this Lesson

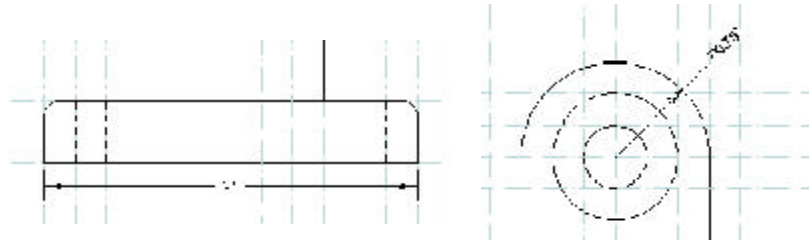
- Dimension using horizontal, vertical, and radial dimensions.
- Switch to paper space.
- Place and modify text.
- Plot the drawing with the **Page Setup** and **Print** commands.

If TurboCAD is not running with the drawing from Lesson 2 loaded, start TurboCAD now and load the MechPart drawing. Alternatively, you can double-click the **MechPart.Tcw** file in Windows Explorer or File Manager; this action loads both TurboCAD and the drawing.

Dimensioning with TurboCAD

TurboCAD's dimensioning capability is similar to AutoCAD's. By default, dimensions are associative in both CAD systems. TurboCAD's associative dimensions move and stretch when the associated object is moved and stretched. For example, rotate the object and the dimension rotates with it.

This is much more powerful than in AutoCAD, whose dimensioning capability is more accurately called "semi-associative"; to have the dimension rotate with the object, the AutoCAD selection set must include both the object and the dimension.



TurboCAD's linear dimensioning (left) and radial dimensioning (right)

In addition to the dimension commands compared below, you can create dimension styles in TurboCAD. Right-click any dimension icon and TurboCAD displays the **Properties** dialog box.

TurboCAD Dimensions	AutoCAD R13/R14 Equivalent	AutoCAD R11/R12 Equivalent
Horizontal	DimLinear	Dim:Hor
Vertical	DimLinear	Dim:Ver
Parallel	DimAligned	Dim:Ali
Rotated	DimLinear	Dim:Rot
Datum	DimOrdinate	Dim:Ord
Baseline	DimBaseline	Dim:Bas
Continuous	DimContinue	Dim:Con
Angular	DimAngular	Dim:Ang
Radius	DimRadius	Dim:Rad
Diameter	DimDiameter	Dim:Dia
Leader	Leader	Dim:Lea
...	DimCenter	Dim:Cen
...	Tolerance ¹	...

¹ Tolerancing text can be simulated in TurboCAD using the **Text Box** option of placing text.

Creating Dimensions

Linear dimensioning in TurboCAD is similar to AutoCAD:

- Step 1:** Select the dimensioning command.
- Step 2:** Pick the starting point for the first extension line.
- Step 3:** Pick the starting point for the second extension line.
- Step 4:** Pick the location of the dimension line.

The difference between the two CAD systems lies in editing the dimension text. In AutoCAD, you can change the text *during* the dimension creation process; in TurboCAD, you select the dimension *after* it is completed: right-click, select **Properties**, and change the dimension's **Attribute**.

Entity Dimensioning

TurboCAD has a much faster way to dimension than AutoCAD: use *entity dimensioning* instead. This method performs a dimension with just two clicks: (1) select the object; and (2) select the position for the dimension line. Done!

While AutoCAD is capable of entity dimensioning, its method requires several keystrokes. On the other hand, AutoCAD's entity dimensioning works from a single command.

Entity dimensioning in TurboCAD is somewhat more rigid: all entity dimensioning occurs during a single command. You don't entity-dimension a horizontal line, then a circle, then another horizontal line, as in AutoCAD; instead, you switch dimensioning commands for each type of dimension in TurboCAD:

- Step 1.** Select the **Horizontal** dimension command.
- Step 2.** Apply all horizontal entity dimensions.
- Step 3.** Select the **Radius** dimension command.s
- Step 4.** Apply all radial entity dimensions.

And so on...

Segment Dimensioning

Actually, TurboCAD has another form of dimensioning called *segment dimensioning*. Whereas entity dimensioning works with an entire group, block, or multiline (a.k.a. *polyline*), segment dimensioning selects the individual line segments within the group, block, or multiline.

Entity dimensioning, however, does dimension the distance between two objects, such as the bolt holes in our drawing. For this reason, we use both methods in this lesson: entity dimensioning and segment dimensioning.

Since our drawing has a scale of 1:1, it is not necessary to set the dimension scale. To change the scale of dimensions in work space (a.k.a. *model space*) change the value of **Dimension Size Scale** in the **Advanced Format** tab in the **Properties** dialog box; to have paper space dimensions displayed at a different scale, change the value of **Linear Measurement Scale** in the **Advanced Text** tab.

AutoCAD Dimensioning

Entity Dimensioning

1. Switch to layer "Dims" by selecting the name from the layer list box on the **Object Properties** toolbar.
2. Select **Dimension | Linear** from the menu bar.
3. You enter AutoCAD's "entity" dimensioning mode when you press **<Enter>** at any dimension command's "...press ENTER to select" prompt.

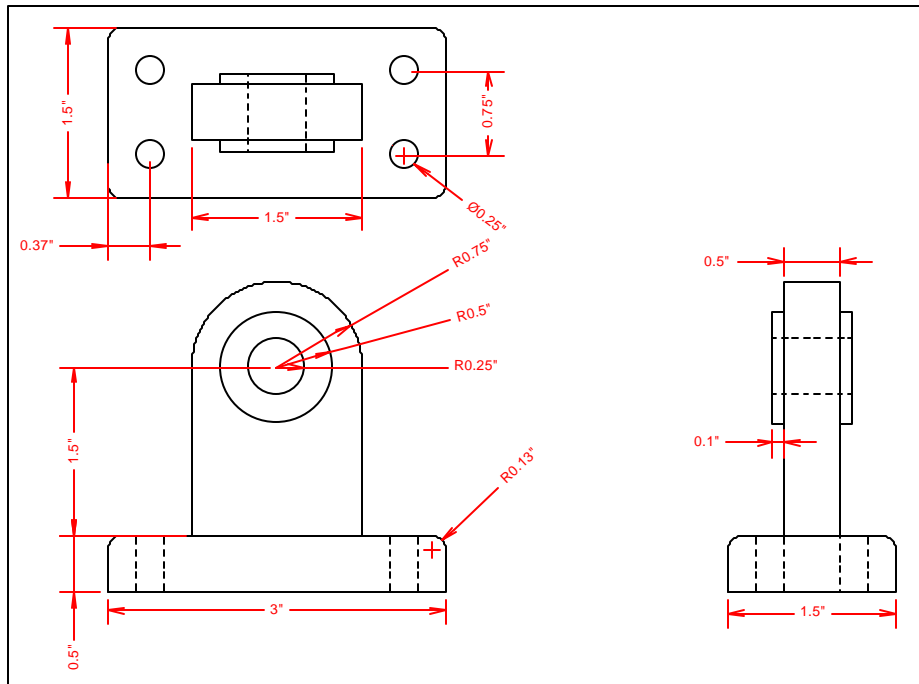
_dimlinear

First extension line origin or press ENTER to select: **<Enter>**

4. Pick the bottom line of the base, as shown in the figure on the TurboCAD side.

Select object to dimension: **<pick>**

5. Move the mouse downward so that the dimension pulls away from the base.
6. Click the mouse button to place the horizontal dimension.
7. Continue entity dimensioning with the **Dimension | Linear** and **Dimension | Radius** commands.



Mechpart drawing with entity dimensions

TurboCAD Dimensioning

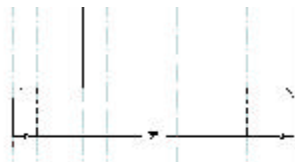
Entity Dimensioning

1. Switch to layer "Dims" by selecting the name from the layer list box on the **Properties** toolbar.
2. Select **Insert | Dimension | Horizontal** from the menu bar.
3. Right-click to display the local menu. Select **Entity Dimensioning** so that a check mark appears.



TurboCAD's local menu toggles between segment and entity dimensioning

4. Select the bottom line of the base, as shown in the figure.



Entity dimensioning

5. Move the mouse downward so that the dimension pulls away from the base.



Positioning the dimension line

6. Click the mouse button to place the dimension.
7. Continue dimensioning with **Insert | Dimension | Vertical** and **Insert | Dimension | Radius**.



Radial dimensioning

Segment Dimensioning

To dimension the distance between the mounting holes on the base:

1. Select **Dimension | Linear**.
2. While holding down the **<Ctrl>** key, right-click and turn on **Center** object snap mode.
3. When AutoCAD prompts you, pick the first circle.

`_dimlinear`

First extension line origin or press ENTER to select: **<pick>**

4. Then, pick the second circle:

Second extension line origin: **<pick>**

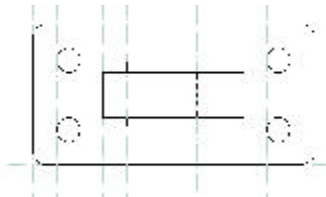
5. Drag the dimension away from the base.

Segment Dimensioning

There remains one area of the mechanical part to dimension that cannot be entity dimensioned: the distance between the mounting holes on the base.

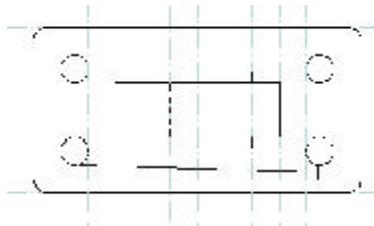


1. Select **Insert | Dimension | Horizontal**.
2. Right-click and deselect (turn off) **Entity Dimensioning**. From **Local Snap**, turn on **Arc Center** snap mode, which also works on circles.
3. TurboCAD prompts you, “Define the first extension line origin or use local menu to select.” Pick the first circle, as shown in the figure.



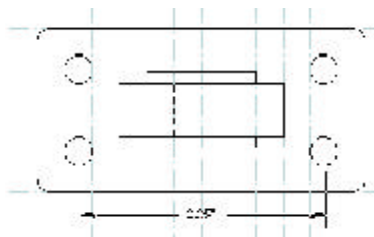
Picking the first circle

4. At the “Define the second extension line origin” prompt, pick the second circle.



Picking the second circle (at right)

5. When TurboCAD prompts, “Define any point on the dimension line,” drag the dimension away from the base.

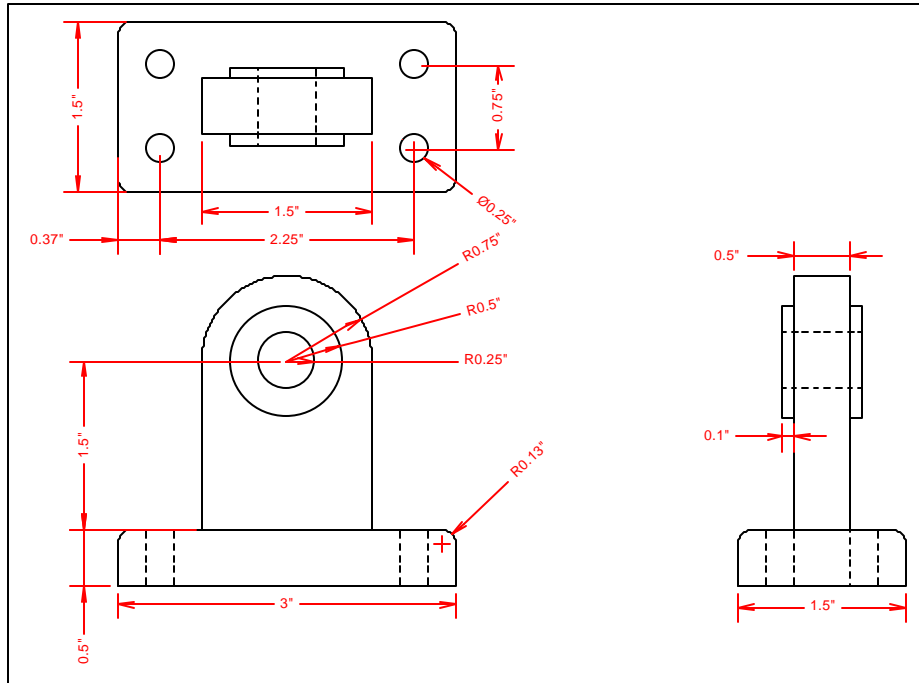


Positioning the dimension line

6. Click the mouse button to place the dimension.

Dimension line location (Mtext/Text/Angle/Horizontal/Vertical/Rotated): **<pick>**

7. Press the **<Enter>** key to repeat the **Dimlinear** command and dimension the vertical distance between the mounting holes.
8. Save your work with **<Ctrl>+S**.



Mechpart drawing with completed dimensioning

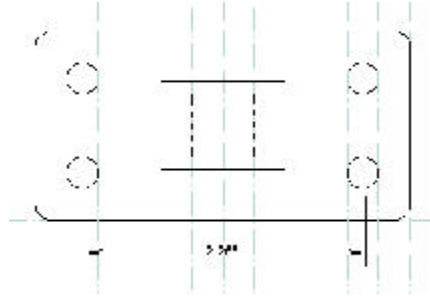
Switching to Paper Space

Before placing text and plotting the drawing, switch model space to paper space.

1. Move the cursor to the word **MODEL** on the status bar
2. Double-click the word **MODEL**.
3. AutoCAD switches to paper space. You should notice the title block and drawing border appear. If necessary, use the **Zoom XP** and scroll bars to position the drawing within the drawing border area.



6. Press **S** to turn off the object snap, which also places the dimension.



Completed dimension between two holes

7. Use the **Insert | Dimension | Vertical** command to dimension the vertical distance between the mounting holes.
8. Save your work with **<Ctrl>+S**.

Switching to Paper Space

Before placing text and plotting the drawing, switch working space (a.k.a. *model space*) to paper space. Note that paper space in TurboCAD is not as sophisticated as in AutoCAD. Essentially, it displays the drawing in “paper” units; the rulers show their measurement in scaled units, as they would appear on the plot.

1. Move the cursor to the work space icon, found at the intersection of the rulers.

Work space icon



2. Click the work space icon.
3. TurboCAD switches to paper space. Since our scale was 1:1, you will not notice any difference in the drawing layout.

Paper space icon



Drawing Text

Let's fill in the title block!

1. Zoom in to the title block area with the **Zoom Window** command.
2. Click the **Text** icon. AutoCAD starts the **MText** command:

```
_mtext Current text style: STANDARD. Text height: 0.2000  
Specify first corner: <pick>
```

3. Click twice in the box under "TITLE". This action creates a rectangle, into which AutoCAD places its Mtext:

```
Specify opposite corner or [Height/Justify/Rotation/Style/Width]:  
<pick>
```

Inserting Text

Like AutoCAD, TurboCAD uses TrueType fonts for text in its drawings; unlike AutoCAD, there are no vector fonts available, which display and plot faster than do TrueType fonts.

Every Windows 95/NT computer system includes several TrueType fonts, such as Arial and Times New Roman, which you can use in your drawing. TurboCAD adds two mono-spaced TrueType fonts during installation: Letter Gothic and Orator. In addition, if you have AutoCAD, you can use the TrueType fonts delivered with R13 and R14 in your TurboCAD drawings.

If your computer's screen resolution is less than 1024x768, you may not be able to see the entire text formatting tools available. In that case, select **View | Toolbars** from the menu bar, then click **Text Format** from the list of available toolbars.

TurboCAD's Text Format toolbar

From left to right, the **Text Format** toolbar lets you select:

- Font name — all TrueType fonts installed in Windows are listed.
- Font size in inches — changes to points in paper space (one point is 1/72 of an inch).
- Bold, italic, underline, and strikethrough.
- Text box — a rectangle is placed around the text.
- Hidden text — text is not displayed in the drawing.
- Standard text — text remains proportionally sized when resized.
- Scalable text — text can be stretched non-proportionally.
- Flexible text — text can have pen, brush, and slanting applied.
- Justification — left (default), centered, or right-justified.

As you can see, TurboCAD's text is much more flexible than AutoCAD's.

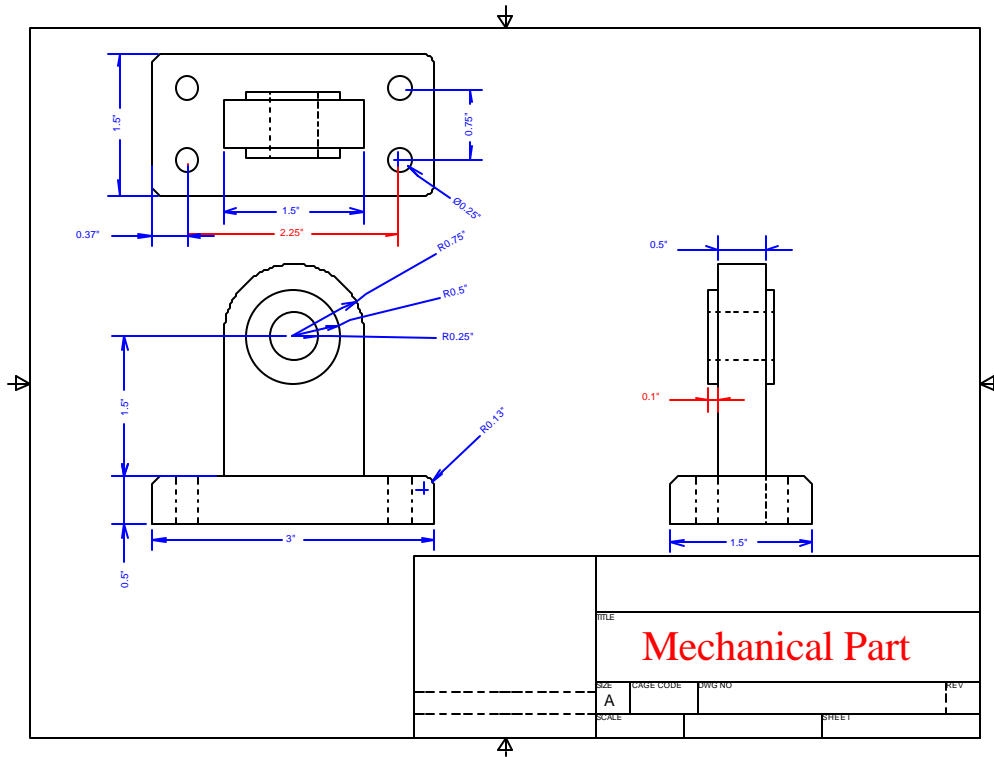
Other options are available from the **Properties** toolbar, such as color and hatch patterning. To set the obliquing angle, bring up the **Properties** dialog box by right-clicking the **Text** icon. To create an AutoCAD-like text style, you go through the process described in the previous chapter for creating an entity style.

Let's fill in the title block!

T

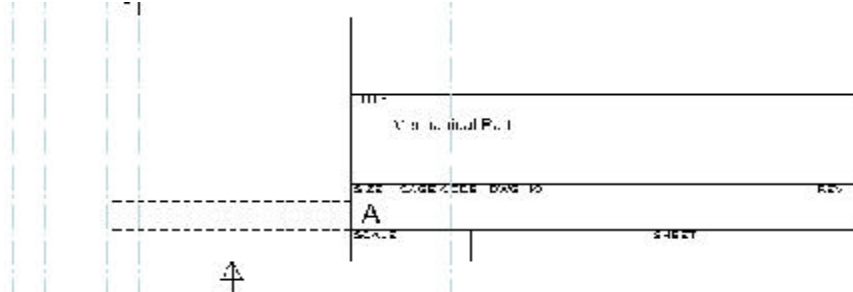
1. Zoom in to the title block area with the **Zoom Window** icon.
2. Click the **Text** icon.
3. Click in the box under "TITLE". Notice how your click point is the top of the text insertion, rather than the bottom, as in AutoCAD.

4. When the **Multiline Text Editor** appears, type “Mechanical Part.”
5. To make the text larger, it takes two steps: (1) use the mouse to highlight the text; and (2) in the **Character** tab, replace 0.2000 with **0.5**. If you do not first select the text, AutoCAD will not change the size of the text.
6. Let’s try changing the font, such as the City Blueprint font that comes with AutoCAD. With the text still highlighted, from the **Text Format** toolbar, select “City Blueprint.” Instantly the font changes to something that looks more like a drafter’s handlettering.
7. AutoCAD doesn’t necessarily let you apply font changes, such as **bold** or *italic*. In the case of City Blueprint, you cannot make it bold since the **B** button is grayed out.
8. When finished with the text, click <OK> and AutoCAD places the text in the drawing.



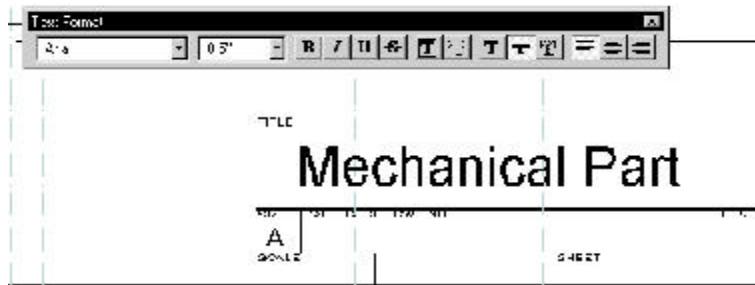
Mechpart drawing with title block filled in

- 4. Type "Mechanical Part."



Entering text in the title box

- 5. Hmm... rather small. From the **Text Format** toolbar, select 0.5". Notice how the text immediately changes size. That's better.



Larger text

- 6. Let's try changing the font, such as the City Blueprint font that comes with AutoCAD. From the **Text Format** toolbar, select City Blueprint. Instantly the font changes to something that looks more like a drafter's handlettering. (If your computer system does not have this font, choose another, such as Times New Roman.)
- 7. If the lettering looks thin, click the **B** button to make the font boldface.

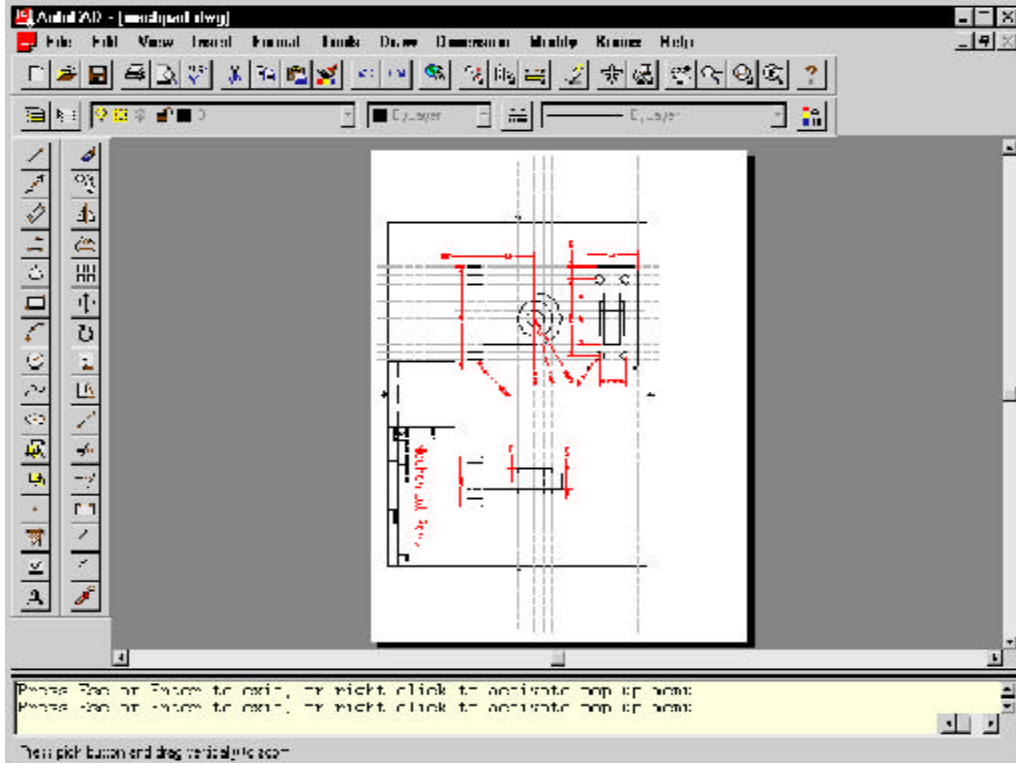


Change of font

- 8. When finished with the text, press <Enter> and TurboCAD prompts you to define the start of another text position.

Plotting the Drawing

To help you preview the drawing before committing to a plot, AutoCAD's **Preview** command (accessed via **File | Print Preview**) lets you see what the plot will look like but gives you no options. Instead, use the **Plot** command.

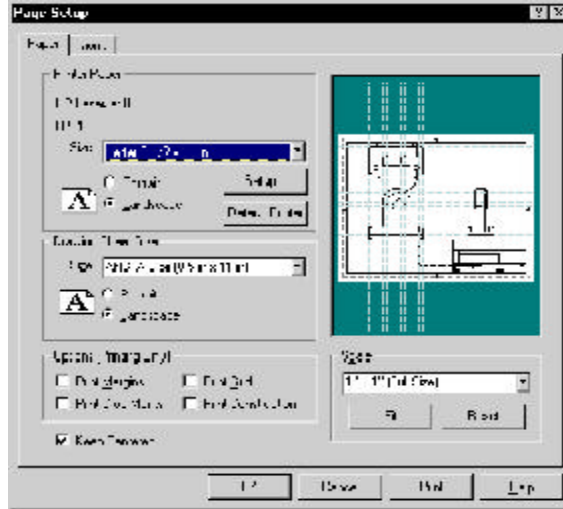


AutoCAD's Preview window

1. To plot the drawing, select **File | Print**. Change parameters to make the drawing fit your printer's paper.

Plotting the Drawing

To help you preview the drawing before committing to a plot, TurboCAD's **Page Setup** dialog box (accessed via **File | Page Setup** — not to be confused with **File | Page Setup Wizard**) gives you two tabs worth of options.



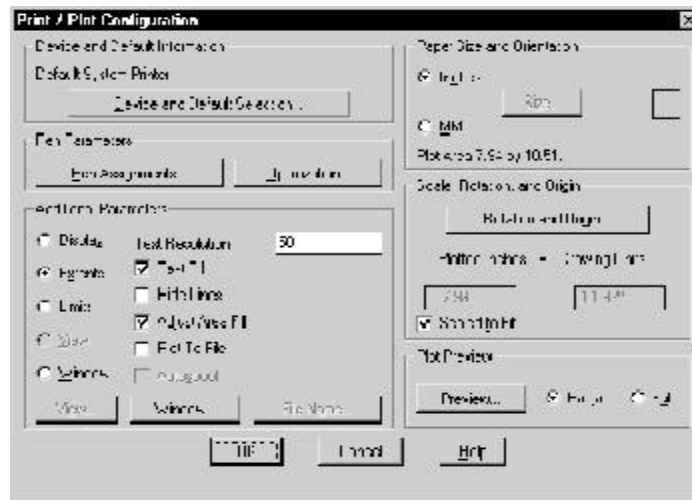
TurboCAD's Paper tab

Paper Tab

The **Paper** tab controls the size, orientation, and optional markings of the paper. You have the option of letting TurboCAD print:

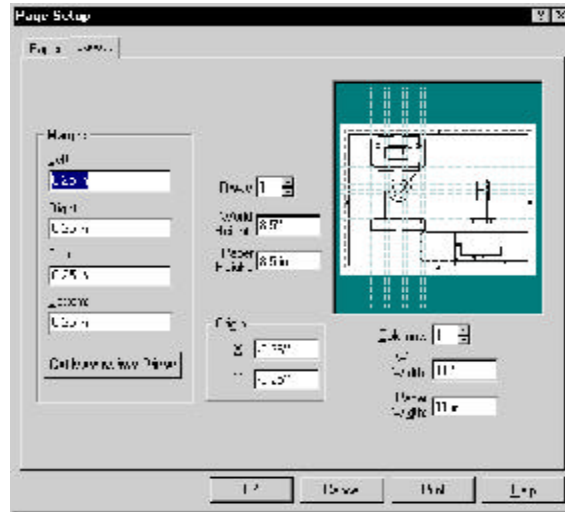
- A rectangular margin around the drawing
- Crop marks at all four corners
- The grid
- Constructionlines

The preview window lets you see what is happening. You cannot select the plotter or printer in this dialog box.



AutoCAD's Plot dialog box

2. Preview the plot by clicking the **Preview** button.
3. Click **OK** to dismiss the **Preview Effective Plotting Area** dialog box.
4. Click the **OK** button to produce a hardcopy of your drawing.



TurboCAD's Layout tab

Layout Tab

The **Layout** tab sets margins, the origin, and whether you want a tiled plot, where the plot is printed on more than one sheet of paper to create a large plot.

Printing the Drawing

The **Print** button warns you that it will print only a preview image; however, this is not true. It, in fact, prints the high-quality plot you would expect.

1. To plot the drawing, select **File | Page Setup** to preview the plot. Change parameters to make the drawing fit your printer's paper.
2. Click **OK** to dismiss the **Page Setup** dialog box.
3. Select **File | Print** from the menu bar to display the **Print** dialog box. The dialog box looks similar to the **Print** dialog box of most other Windows applications. There are two differences you should be aware of:
 - **Print Source:** TurboCAD can print the entire drawing or the current selection set. This is roughly analogous to AutoCAD's Plot Window option.
 - **Print Range - View:** TurboCAD prints a named view, just like AutoCAD's Plot View option.
4. Click the **OK** button to produce a beautiful plot of your hard work.

Summary

In this lesson, you learned how to dimension the drawing, switch from working space to paper space, place text, and plot the drawing.

This concludes the side-by-side comparison of AutoCAD and TurboCAD working methods.

In the following chapters, you learn about exchanging drawings between AutoCAD and TurboCAD, and have a look at how the two CAD systems interact with the Windows Clipboard and OLE.

4

DWG Import & Export

Translating Drawings from AutoCAD

TurboCAD Professional v4.0 imports and exports drawings made by AutoCAD and other CAD packages. Specifically, TurboCAD imports and exports files with the extensions of **DWG** (short for “DraWinG”) and **DXF** (officially the abbreviation for “Drawing interchange Format” or more popularly, “Drawing eXchange Format”). In general:

- You would import a DWG file when the drawing comes direct from AutoCAD Release 13 or earlier.
- You would use a DXF file when the drawing comes from another CAD package.

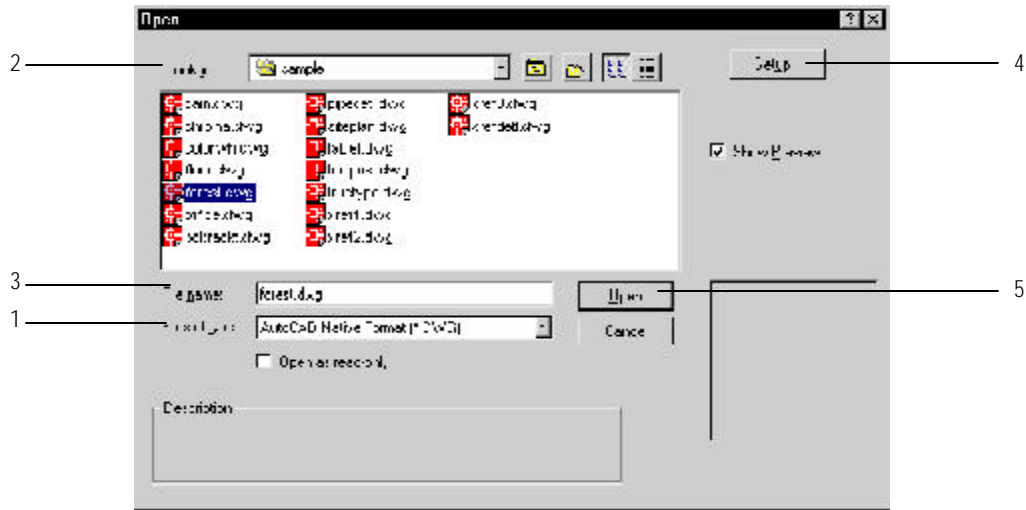
There is no point to importing a DXF file from AutoCAD since that requires the additional step of translating from DWG to DXF.

Similarly, save the TurboCAD drawing in DWG format when it will be read by AutoCAD. Save the TurboCAD drawing in DXF format when it will be read by software other than AutoCAD.

In this chapter, we look in detail at how TurboCAD reads and writes DWG files. The process is identical for translating DWG and DXF files.

Importing a DWG File

To bring an AutoCAD drawing into TurboCAD, use TurboCAD's **File | Open** command, which displays the **Open** dialog box.



TurboCAD's Open dialog box

When the dialog box appears, follow these steps:

1. Select "AutoCAD Native Format (*.DWG)" from **Files of Type** list box. TurboCAD displays all files with the .DWG extension in the current folder (a.k.a. *subdirectory*).
2. If necessary, change to another folder and drive with the **Look in** list box. TurboCAD remembers the file extension and folder you select for the next time you use the **Open** command.
3. Select the AutoCAD drawing file.
4. If you want to change the import options, click the **Setup** button. TurboCAD displays the **DWG File Import** dialog box. In most cases, all options are set for the most accurate translation. The only change you might want to consider is turning on the **Create** option of **Model Space Viewports**. (More details in the section following.) Click **OK** to dismiss this dialog box.
5. Back in the **Open** dialog box, click the **Open** button to begin importing the drawing. After a minute or two, TurboCAD displays the AutoCAD drawing. At this point, you should carefully check the translated drawing to make sure it is accurate. More details appear later in this chapter's "Accurate DWG Translation" section.



WARNING: At time of writing, TurboCAD Professional v4 does not import drawings created by AutoCAD Release 14. A DWG Release 14 filter is available as a maintenance release. Contact IMSI for details. When you attempt to open a R14 DWG or DXF file without the R14 filter, TurboCAD warns:

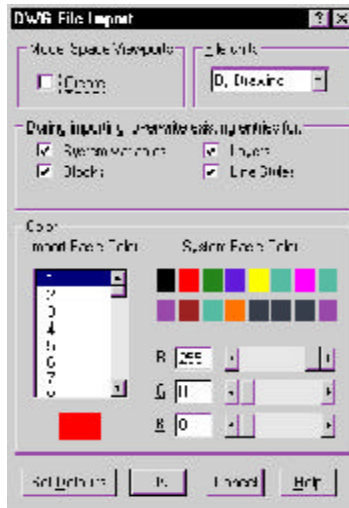


TurboCAD's failed-to-open dialog box

The solution is to go back to AutoCAD Release 14. Use the **File | Save As** command, then select the "AutoCAD R13/LT 95 Drawing (*.dwg)" item from the **Save as Type** list box. Save the drawing by a different name (so that it does not overwrite the original R14-format drawing file). Now you will be able to import the drawing into TurboCAD.

DWG File Import Options

The DWG File Import dialog box is available when importing DWG and DXF files. In the **Open** dialog box, click **Setup**.



TurboCAD's DWG File Import dialog box

Model Space Viewports

The **Create** option tells TurboCAD to replicate the viewports in model space. When turned off, this option imports the drawing without viewports. TurboCAD does not import paperspace viewports, although it does import objects created in paperspace.

File Units

In the **File Units** section, you have the option of letting TurboCAD automatically set the units with the **By Drawing** option, or to force the following units: in, ", ', or ft. Since AutoCAD works with “unitless” units, TurboCAD translates these into named units.

During Importing, Overwrite Existing Entities

Usually, you want the drawing coming in to preserve its own settings and overwrite TurboCAD’s default settings. In this section, you can tell TurboCAD how to handle entries for **System Variables**, **Blocks**, **Layers**, and **Line Styles** (a.k.a. *linetypes*). Note that you cannot directly change TurboCAD’s system variables, as you can with AutoCAD’s SetVar command.

Color

AutoCAD and TurboCAD use numbers to identify colors. However, the CAD systems assign a different color and color *name* to each color number. The following table shows the first nine colors:

Color Number	AutoCAD Color Name	TurboCAD Color Name
0	Background color	...
1	Red	Transparent (no color or fill)
2	Yellow	Black
3	Green	Red
4	Cyan (light blue)	Green
5	Blue	Blue
6	Magenta (pink)	Yellow
7	Black or white	Cyan (light blue)
8	Gray	Magenta (pink)

Notice that only color #5 is the same — blue — for both CAD systems. If the color names were not properly matched to color numbers, your imported drawing would appear with the wrong colors. For example, everything drawn in AutoCAD with black (color #7, the most commonly-used color) would appear light blue in TurboCAD. The translator changes all AutoCAD color #7 to #2.

Ignore Unknown Objects (DXF import only)

It is not uncommon for a DXF file to be corrupted or improperly created. For this reason, TurboCAD’s translator will ignore objects it does not recognize.

Set Defaults

After you’ve made changes to this dialog box, you can quickly revert the settings to their original values by clicking the **Set Defaults** button.

Accurate DWG Translation

The translation of a drawing is only considered 100% accurate when no objects (nor their properties) are erased or changed. Unfortunately, this is never possible between AutoCAD and TurboCAD — nor between any other CAD package you care to name.

The following is a concise summary of the objects erased and changed when importing an AutoCAD drawing into TurboCAD.

Objects Erased from DWG

TurboCAD erases these objects during translation, listed in alphabetical order:

Attributes

Attributes are found in all releases of DWG. Attributes are data typically attached to a block and are created by AutoCAD's **AttDef** (or **DdAttDef**) command. The problem of erased attributes will be fixed in the maintenance release. You should contact IMSI to obtain the most recent DWG translation functionality.

Leader

Leader objects are found in DWG Release 13 and later. A leader object consists of an arrowhead and a line. It is created by the **Leader** command. The leader text is a separate mtext object. Leaders created in R12 (or earlier) with the **Dim:Leader** command are translated correctly by TurboCAD.

Mtext

Mtext objects are found in R13 and later. Mtext is also known as *paragraph text* and is created with the **MText** command. Text created with the **Text** and **DText** commands is translated correctly.

OleFrame

OleFrame v1 objects are found in R13, while OleFrame v2 objects are found in R14. An OleFrame object is created by placing an OLE object in the AutoCAD drawing using the **InsertObj** command or by selecting **Insert | Object** from AutoCAD's menu bar.

Region

Region objects are found in R13 and later. A region is a two-dimensional ACIS object. It is created by several commands, including **Region**, **BHatch**, **Slice**, and **Boundary**.

Shape

Shapes are found in all versions of DWG. While users tend not to use shapes (in favor of blocks), shapes are used by AutoCAD for complex (2D) linetypes, which are found in R13 and later. Shapes are created by the **Shape** and **Linetype** commands. TurboCAD does not read the SHP (source code) and SHX (compiled) files that define shapes.

Spline

Splines are found in R13 and later. The spline is a NURBS object, short for “non-uniform rational Bezier spline.” NURBS-based splines are created by the **Spline** command. Note that non-NURBS splines made with the **PLine** and **PEdit** commands are translated correctly by TurboCAD.

Tables

Tables are found in all versions of DWG. Tables are used by the DWG file to define the names. TurboCAD erases the following table names: views, UCSs, viewports, text styles, dimstyles, and appids. The names of blocks, layers, and linetypes are preserved.

Tolerance

Tolerance objects are found in R13 and later. They are created by the **Tolerance** command. Like complex linetypes, AutoCAD makes use of SHX (shape) files to create tolerance objects. While they are erased by TurboCAD, tolerances can be simulated using boxed text in TurboCAD.

Xref

Xref objects are found in R10 and later. Xref is short for “externally-referenced drawing” and are created by the **Xref** command.

Zombie (Proxy)

Zombie objects are found in R13 and are renamed as “proxy” objects in R14. These are objects created by a third-party application. AutoCAD is able to display and print zombie objects but cannot edit them.

Objects Changed from DWG

In addition to having some specific objects erased, you can expect the following changes to occur in certain objects in the drawing:

Text

- All text becomes Times New Roman.
- Text loses the following style properties: obliquing angle, backwards text, vertical text, upside-down text, and Fit justification.
- Most %% text codes are translated correctly, except for %%o (overline) and %%p (the per cent symbol).

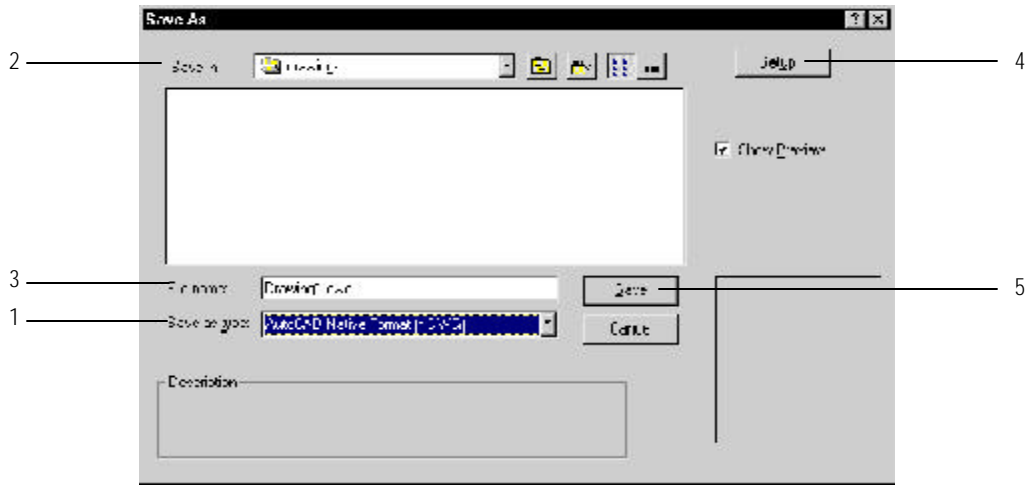
Objects

- Dimensions lose their associativity.
- Points are translated to 0" size, making them invisible. While points seem to disappear, window the area in which you suspect the points should be located. TurboCAD displays the points' handle. Change the size of the points to make them visible.
- Polylines with *variable* width lose all their width information.
- Splined polylines display additional segments.
- Rays become infinite, rather than staying semi-infinite.
- Complex (2D) linetypes display incorrectly because TurboCAD does not read SHX files.

Exporting in DWG Format

To bring a TurboCAD drawing into AutoCAD, you must translate it from within TurboCAD. AutoCAD cannot read drawings created by any other CAD package, unless you purchase a separate translator product.

To save the drawing in DWG format, select **File | Save As** from the menu bar. TurboCAD displays the **Save As** dialog box.



TurboCAD's Save As dialog box

1. In the **Save as type** list box, change the file type to “AutoCAD Native Format (*.DWG).” To allow other CAD packages to read the TurboCAD drawing, save in DXF format by selecting “Drawing eXchange Format (*.DXF)” instead.
2. If necessary, change to another folder or drive with the **Save in** list box.
3. Although it is not usually necessary, you can change the filename with the **File name** text box.
4. Click the **Setup** button to display the **DWG File Export** dialog box (the setup for DXF files is identical).
5. Click **Save** to save the drawing in DWG (or DXF) format.



NOTES: TurboCAD allows you to save the entire drawing or a selection set. You cannot save a preview image when saving to DWG and DXF formats.

DWG File Export Options

The **DWG File Export** dialog box provides the following options:



TurboCAD's DWG File Export dialog box

Unblock

When the translated drawing doesn't look very good in AutoCAD, TurboCAD recommends that you try unblocking (a.k.a. *explode*) blocks in the drawing. The list box displays the names of all blocks in the drawing. The "Whole Drawing" selection unblocks all blocks in the drawing.

Make Blocks Out of Complex Graphics

When the TurboCAD drawing contains groups, dimensions, double lines, curves, and hatch patterns, this option allows you to convert these objects into blocks. This helps preserve the collection of objects as a single object.

Explode Text

If the CAD system cannot read TurboCAD's text, this option explodes text into lines and arcs.

Decimal Places Accuracy

The default value of 6 decimal places (0.00 000 1) is good enough for most drawings. A higher value (maximum = 16 places) results in greater accuracy at the cost of a larger file size and longer processing time.

Setting Default

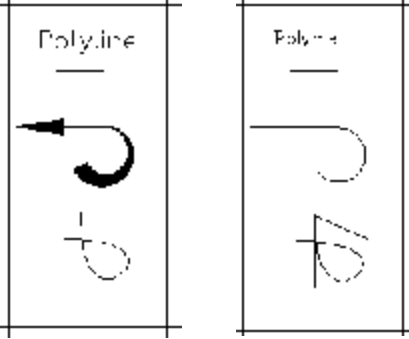
To change the values back to their defaults, click this button.

The Content of DWG

The table below details all aspects of the contents of a DWG file.

- “Converted To” names the TurboCAD object that the corresponding DWG object is converted into.
- Ellipses (...) means the object fails to convert.
- “Polyline, Filled” entry means the AutoCAD object is approximated by a TurboCAD polyline outline, then solid filled.
- “(r13)” indicates the object is specific to AutoCAD Release 13 and is not found in earlier versions of AutoCAD.

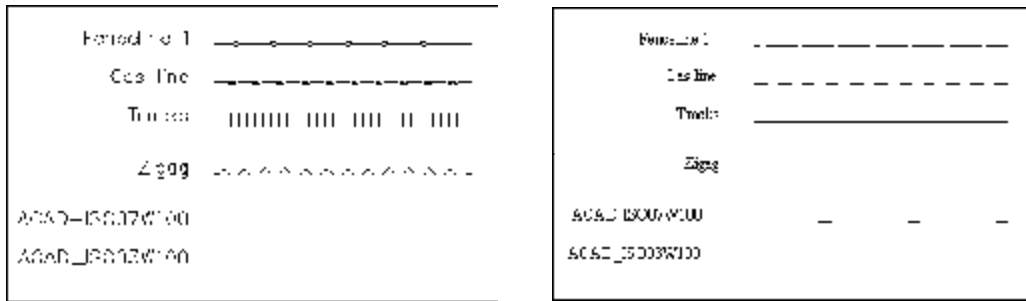
DWG Object	Converted To	Notes
3D Face	Surface	
3D Mesh	3D Mesh	
Polymesh	Surface	
ACIS objects:		
3D solid (r13)	Surface	
Region (r13)	...	Erased; not converted.
Arc	Arc	
Block:		
Insert	Block insertion	
Attributes	...	Erased; not converted.
Circle	Circle	
Dimension		
Leader (r13)	...	Erased; not converted.
Tolerance (r13)	...	Erased; not converted.
Ellipse (r13)	Ellipse	
Hatch	Block insertion of extended data	
Line	Line	
Mline (r13)	...	Erased; not converted.
Mtext (r13)	...	Erased; not converted.
OLE frame (r13)	...	Erased; not converted.
Point	TCW30POINT	Invisible; size = 0in.

DWG Object	Converted To	Notes
Polyline	Line	
Ellipse (pre-R13)	Polyline	Many vertices.
Polygon	Polyline	
Donut	Polyline	Filled.
3DPolyline	Polyline	
Polyline properties:		
Polyarc	Polyline	
Splined	Polyline	Many vertices.
Width	Polyline	Filled.
Variable Width	...	Variable width missing.
		
AutoCAD's polylines (left) and TurboCAD's translation (right)		
Ray (r13)	Construction Line	Infinite length.
Shape	...	Erased; not converted.
Solid (2D filled area)	Polyline	Filled.
Spline(r13)	...	Erased; not converted.
Text	Text	All fonts converted to Times New Roman.
Trace	Polyline	Filled
Viewport object	...	Erased; not converted.
Xline (r13)	Construction Line	TCP linetype, color, and layer.
Xref	...	Erased; not converted.
Zombie (r13)	...	Erased; not converted.

Named Objects (Tables)

In addition to objects, a DWG file contains *tables*. These are nothing more than named objects, such as layer names, text styles, and view names. Each of these names is up to 31 characters long. Unlike some other CAD systems that truncate the names down to six or eight characters, TurboCAD easily imports the full 31-character string. Below you see the effect of converting AutoCAD tables to the equivalent in TurboCAD.

Table Name	Notes
APPID	Application identification (stores the names of third-party software used by the AutoCAD drawing): erased; not required by TurboCAD.
BLOCK_RECORD	Names of blocks: converted correctly.
DIMSTYLE	Dimension style names: erased.
LAYER	Names of layers: TurboCAD successfully imports more than 300 layers.
Length of Layer name	Successfully imports 31-character layer names (AutoCAD's maximum).
Layer ASHADE	ASHADE
Layer DEFPOINTS	DEFPOINTS
Other layers created	\$CONSTRUCTION
Maximum number of colors	255 (same as AutoCAD)
LTYPE	Names of linetypes: TurboCAD displays basic linetypes correctly.
Complex (2D) linetypes	Portions missing; TurboCAD cannot import SHX files required for 2D linetypes.

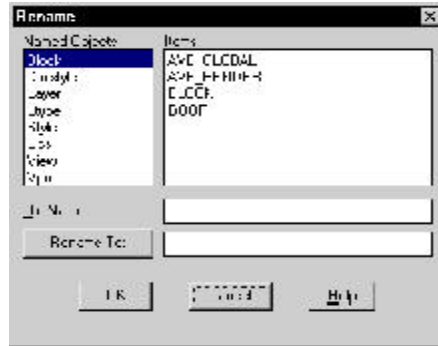


AutoCAD's complex linetypes (left) and TurboCAD's translated line styles (right)

STYLE	Names of text styles: erased.
UCS	Names of user-defined x,y,z-coordinate systems: erased.
VIEW	Names of views: erased.
VPORT	Names of viewport configurations: erased.
Paper space viewports	Not preserved.
Model space viewports	Not preserved.



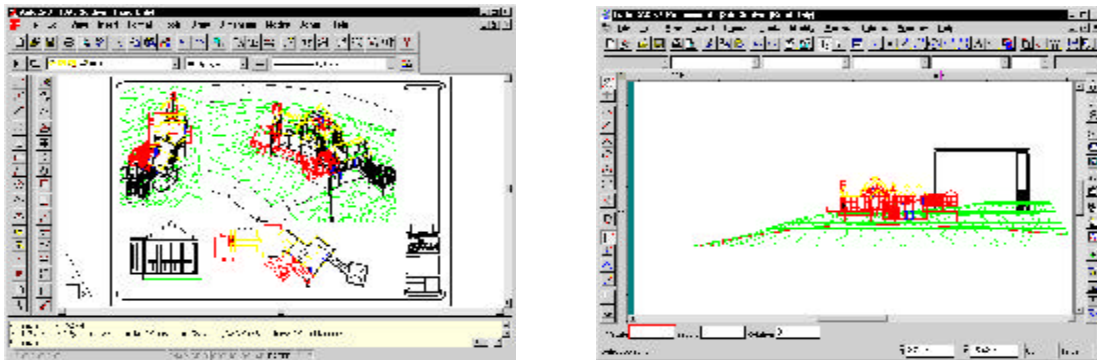
TIP: You can see the names of most table entries with AutoCAD's **DdRename** command. The **Rename** dialog box lists the names found in *Block*, *Dimstyle*, *Layer*, *Ltype*, *Style*, *Ucs*, *View*, and *Vport* tables. Unfortunately, it does not list all table entries. Missing are: *Appid* names, *anonymous Block* names (those that begin with *), *named groups*, and names of *multiline styles*. When finished viewing table names, click the **Cancel** button to dismiss the dialog box.



AutoCAD's Rename dialog box lists many named objects

Paper Space Viewports & XRefs

Paper space is a complex subject, even one that Autodesk continues to battle with. Most CAD systems — including TurboCAD — simply cannot recreate a drawing saved in paper space with multiple, overlapping viewports. TurboCAD displays paper space objects in model space; however, paper space viewports are discarded, as the sample Site-3D drawing below shows.



AutoCAD drawing with paper space (left) and TurboCAD's translation (left)

Similarly, TurboCAD does not import externally-referenced drawings at all. Blanks appear where the xrefs should be located.

Text and Styles

Of all objects in a CAD drawing, text has the largest number of parameters, as the table below shows. Although TurboCAD's default font is Arial (TrueType), it translates all AutoCAD fonts to Times New Roman. Mono-spaced fonts are not translated to TurboCAD's mono-space fonts.

TEXT:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	TEXT:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
MENUSX:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	MENUSX:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
SIMPLEX:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	SIMPLEX:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
ROMANS:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	ROMANS:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
ROMAND:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	ROMAND:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
ROMANC:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	ROMANC:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
ROMANT:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	ROMANT:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
COMPLEX:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	COMPLEX:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
ITALIC:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	ITALIC:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
SYASTR:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	SYASTR:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
SYMAP:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	SYMAP:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
SYMCL:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	SYMCL:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>
SYMUSIC:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>	SYMUSIC:	<u>ABCDEFGHIJKLMN OPQRSTUVWXYZ</u>

All of AutoCAD's vector fonts (left) are translated to Times New Roman by TurboCAD (right)

Text Parameter

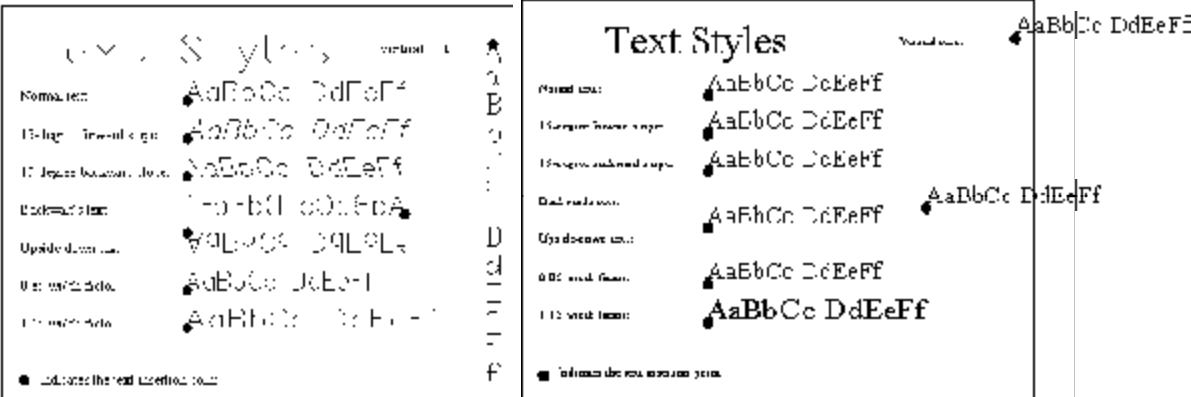
Notes

Styles:

Oblique forward	Not translated; however, obliquing is available in TurboCAD.
Oblique backward	Not translated; however, obliquing is available.
Backward text	Not translated, however this is available with flexible text in TurboCAD.
Vertical text	Not translated, however this is available with flexible text.
Upside-down text	Not translated, however this is available with flexible text.
Width factor narrow	Not translated.
Width factor wide	Translated correctly.

Justification modes:

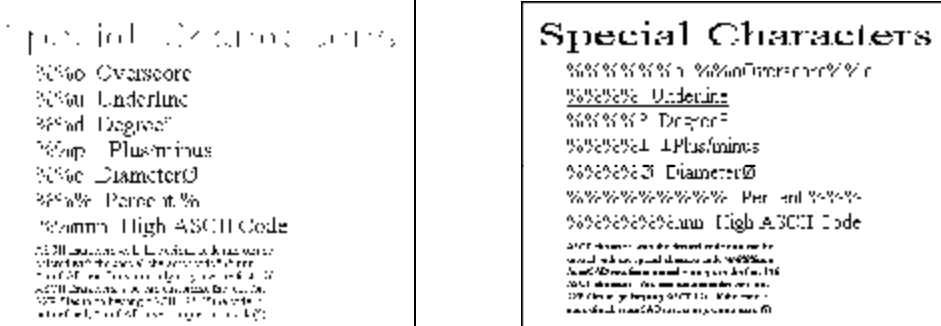
Aligned	Translated correctly.
Fit	Not stretched to fit.
Center	Translated correctly.
Middle	Translated correctly.
Right	Translated correctly.
Other justifications	Translated correctly.



AutoCAD's style options (left) and TurboCAD's translation (right)

Miscellaneous:

Rotated text Translated correctly.
 %% Codes %%o and %%p translated literally.

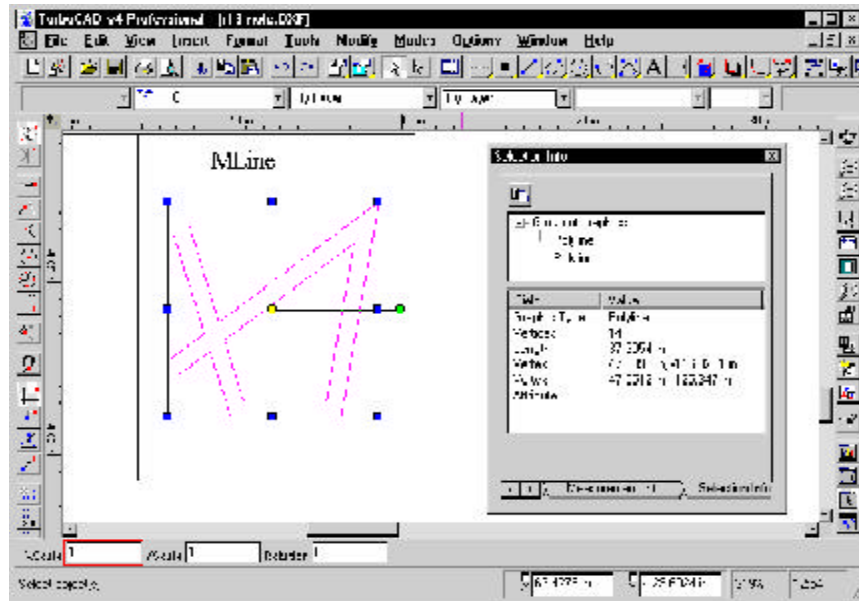


AutoCAD's %% codes (left) and TurboCAD's translation (right)

MText codes (R13) MText is not translated, including Unicodes.

Post-translation Checking

If, after translation to TurboCAD, you find objects in the drawing that puzzle you, use the **Select** cursor and the **Selection Info** window as your investigative tools. Simply click an object (or window a group of objects) and the **Selection Info** window and **Properties** toolbar tell you everything TurboCAD knows about the object(s).



TurboCAD's Property toolbar and Selection Info palette

Summary

Despite these difficulties, the translation works out to be pretty good in many cases. Your typical 2D floorplan is going to translate smoothly. Lines, circles, colors, line styles — they all convert effortlessly.

It is the more esoteric corners of AutoCAD that do not translate properly. Here are some tips to help make the translation smoother:

- Drawings created with AutoCAD Release 12 or earlier translate more accurately.
- Avoid drawings with objects specific to Release 13.
- Don't rely on polylines with variable width.
- Avoid using complex linetypes.
- Use the **Dim:Lea** command instead of the **Leader** command.
- Use the **PLine** and **PEdit** commands to create splines instead of the **Spline** command.
- Use the **Text** and **DText** commands instead of the **MText** command.
- Use TrueType fonts, such as Times New Roman, instead of AutoCAD's vector fonts.

5

Windows Clipboard & OLE

Exchanging Drawing Data via the Clipboard

In this lesson, you learn about bringing TurboCAD drawings into other Windows applications (and vice versa) via the Windows Clipboard. You also learn about OLE, object linking and embedding. The Clipboard and OLE are useful for performing the following tasks:

- Placing drawings in typical office applications, such as a spreadsheet, a desktop publishing document, and a technical design.
- Exchanging symbols via WMF with AutoCAD.
- Linking and embedding TurboCAD drawings.

Drawing Translation via the Clipboard

In the previous chapter, when we said AutoCAD does not translate drawing files from other CAD packages, we lied. AutoCAD does indeed translate in one situation: when a drawing is imported from the Windows Clipboard. Follow these steps to bring a TurboCAD symbol into AutoCAD *without apparent translation*:

1. In TurboCAD, open a blank drawing.
2. In the **Symbol** palette, select “Basic, Library Folder.”
3. From the **Symbol** palette, drag the “Incandescent Light...” symbol into the drawing.

Symbol in TurboCAD



3. Ensure the object is selected. (TurboCAD construction lines are never copied to the Clipboard.)
4. Select **Edit | Copy** from the menu bar, or press <Ctrl>+C. Depending on the size of the drawing, TurboCAD takes a bit of time copying the drawing to the Windows Clipboard — the time ranges from less than a second to nearly a minute. Watch the status bar.
5. Start AutoCAD with any drawing you want the symbol in, but for this exercise a blank (“Start from Scratch”) drawing will do.
6. Select **Edit | Paste Special**. AutoCAD displays the **Paste Special** dialog box, which lists five choices for pasting formats.

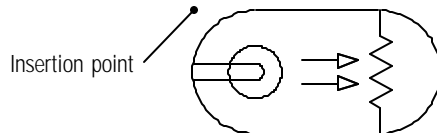


AutoCAD's Paste Special dialog box

7. To translate the TurboCAD symbol into AutoCAD format, select **AutoCAD Entities**. The four other options listed in the dialog box do not translate the symbol; instead, they store the symbol in the AutoCAD drawing in an uneditable format.
8. Click **OK**. Depending on the size of the drawing, it may take anywhere from one second to one minute for AutoCAD to paste the symbol in the drawing.
9. AutoCAD displays the (familiar) prompts for the **Block** command:

```

_pastespec Insertion point: <pick>
X scale factor <1> / Corner / XYZ: <Enter>
Y scale factor (default=X): <Enter>
Rotation angle <0>: <Enter>
    
```



Symbol inserted in AutoCAD

When an object is pasted from the Clipboard, AutoCAD changes the insertion point to the upper-left corner, from the traditional location of the lower-left corner.

10. At this point, you cannot edit the symbol because AutoCAD inserted it as a block. Use the

Explode command to get rid of the block status:

```
Command: explode
Select objects: <pick block>
1 found Select objects: <Enter>
```

11. Using the **List** command, you'll notice that AutoCAD converts the vector data from the Clipboard into polylines, 2D solids, and text:

- Circles consist of a hundred or so polyline segments arranged in a circular fashion.
- Linetypes are represented by short, individual polylines; a single dotted line becomes tens or hundreds of very short polylines.
- Solid-filled areas are translated into 2D solids.
- Text is translated by AutoCAD into text, complete with style names. You can easily change the look of the text by changing the style definition with the **DdStyle** command.

12. You can edit the symbol or save it to disk in DWG format.

On-the-Fly Translation

It *appears* that no translation takes place when you copy-and-paste the symbol to and from the Clipboard. In fact, translation happens on-the-fly, in the background. The translation occurs in two stages:

Stage 1. When you press <Ctrl>+C in TurboCAD, it translates its drawing into 11 different data formats, then stores all that data in the Windows Clipboard.

Stage 2. When you select the "AutoCAD Entities" format in AutoCAD's **Paste Special** dialog box, AutoCAD looks at those 11 data formats and picks the one it works with best — most likely EMF (short for "enhanced metafile"), a vector format similar to a CAD drawing. AutoCAD translates the EMF data into polylines and text, then wraps them all up in a block with the name "WMF0."

You *cannot* bring an AutoCAD symbol into TurboCAD by the same method. That's because TurboCAD does not translate data from the Clipboard into TurboCAD entities. To import an AutoCAD drawing, it is best to use TurboCAD's file translation, as described in the previous chapter.

Clipboard Translation

The drawback to the Clipboard's "invisible" translation is that you have little or no control over the process. As well, translation is not particularly good and is fraught with quality problems. Being aware of the problems ensures you will be more successful.

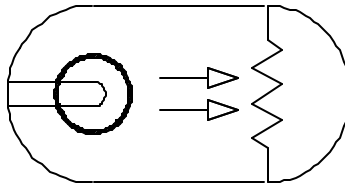
WMF Options

AutoCAD's `WmfOpts` command lets you select exactly two options: wide lines and solid-filled areas.



AutoCAD's WMF Import Options dialog box

The effect of toggling the two options are shown below:



Wide lines and fills (left); AutoCAD's default (center); no wide lines and no fills (right)

For the WMF options to take effect, you must set them *before* you copy objects to the Clipboard.

Clipboard Translation

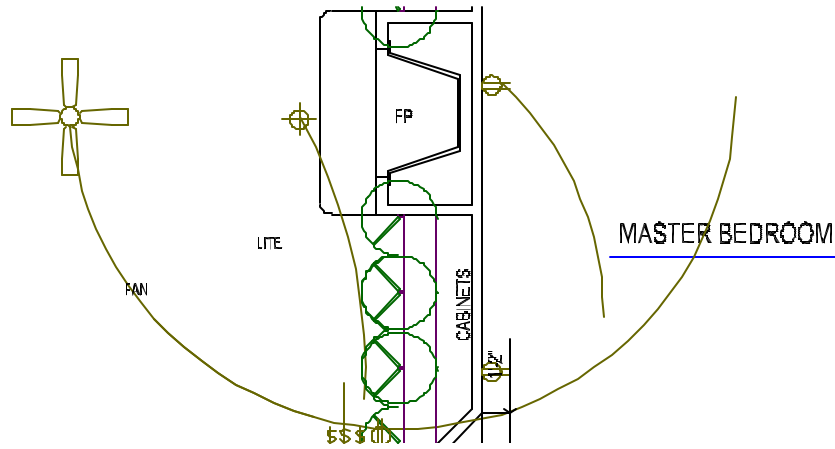
Even more problematic is that the Clipboard translation loses much more information than does DWG-to-TurboCAD file translation. The following changes occur:

Original Drawing	AutoCAD's Clipboard Translation
Solid filled areas	2D solids.
Text	Text.
All other objects	Polylines.
Colors	All 255 colors retained.
Table data	All lost, including layer names; new text styles generated.
Scale	AutoCAD's scale factor is zoom dependent.

Errors Introduced by Clipboard Translation

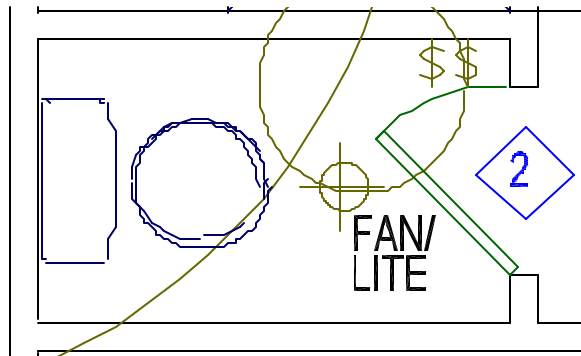
Using the Clipboard can introduce errors in the drawing, including incorrect scaling, stray vectors, and resolution dependencies. Incorrect scaling is due to a number of technical factors. The same object pasted at different zoom levels results in several copies of the object, each a different size — even when you specify the x,y,z-scale factor each time to be 1.0.

Stray vectors tend to occur when the copying and pasting process is interfered with. Interference can occur when your computer is low on available memory, or when your computer is processing another task at the same time.



The large arcs are stray vectors

The resolution of Picture format depends on the drawing's zoom level. Curved shapes and text can come out looking jagged when the elements are copied at a low zoom magnification. This may come as a surprise to you since vector formats (such as Picture) should be independent of resolution.



The toilet symbol used to be a smooth ellipse

From AutoCAD to TurboCAD

You can use the Clipboard to display AutoCAD drawings in TurboCAD. AutoCAD has two commands for copying objects to the Clipboard: **CopyLink** and **CopyClip**.

The **CopyLink** command (or select **Edit | Copy Link** from the menu bar) copies everything visible in the current viewport. Despite its name, the command doesn't "link" anything.

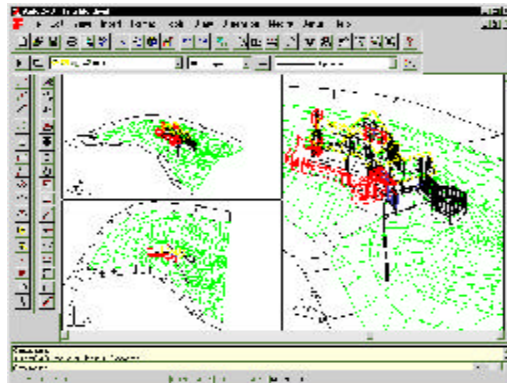
The **CopyClip** command (or select **Edit | Copy** from the menu bar) prompts you, as follows:

```
Command: copyclip  
Select objects: all  
Select objects: <Enter>
```

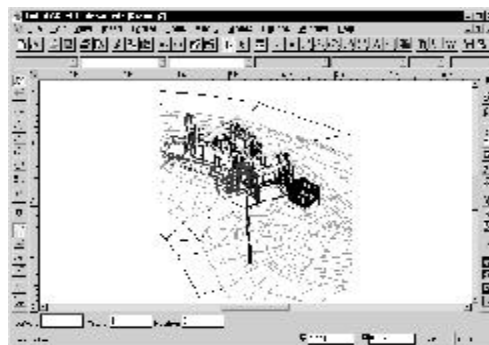
"All" takes on different meanings, depending on AutoCAD's model/paper space and tilemode setting.

Tilemode = 1 (On)

- In *model space*, AutoCAD copies only objects visible in the current viewport. If the drawing contains more than one viewport, you must select the correct viewport before copying objects to the Clipboard. The **CopyClip** and **CopyLink** commands have the same effect:



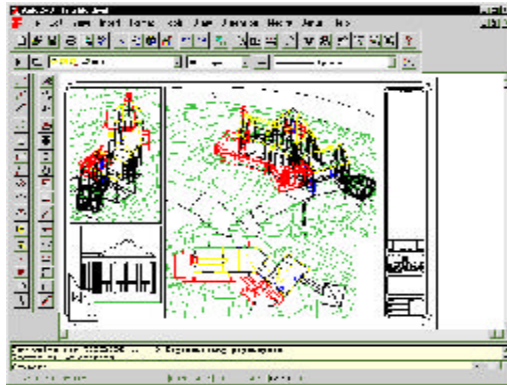
AutoCAD viewports with Tilemode = 1



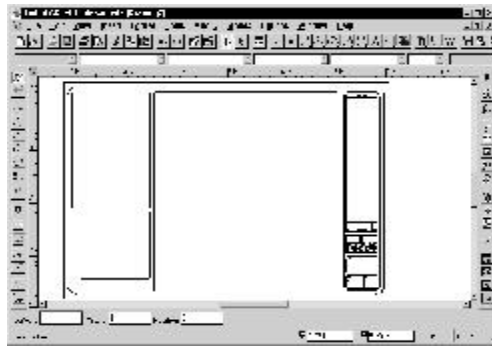
Viewport pasted in TurboCAD

Tilemode = 0 (Off)

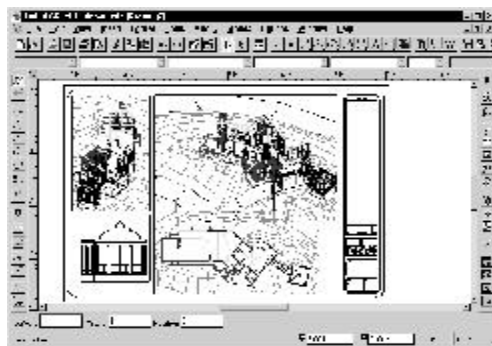
- In *paper space*, the **CopyClip** comand copies objects drawn only in paper space. Nothing drawn in model space is copied to the Clipboard, even if it is visible. The **CopyLink** command copies all objects, whether drawn in paperspace or modelspace.



AutoCAD viewports in paper space (Tilemode = 0)

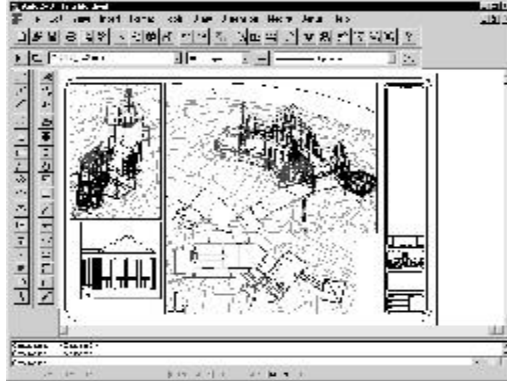


Result in TurboCAD after using AutoCAD's ClipClip command

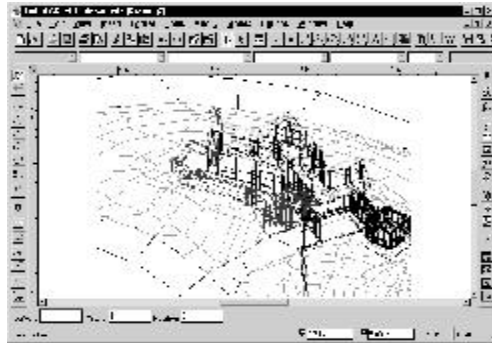


Result in TurboCAD after using AutoCAD's CopyLink command

- In *model space*, AutoCAD copies only objects drawn in *model space* that are visible in the selected viewport. The **CopyClip** and **CopyLink** commands produce the same result in TurboCAD and any other applications.



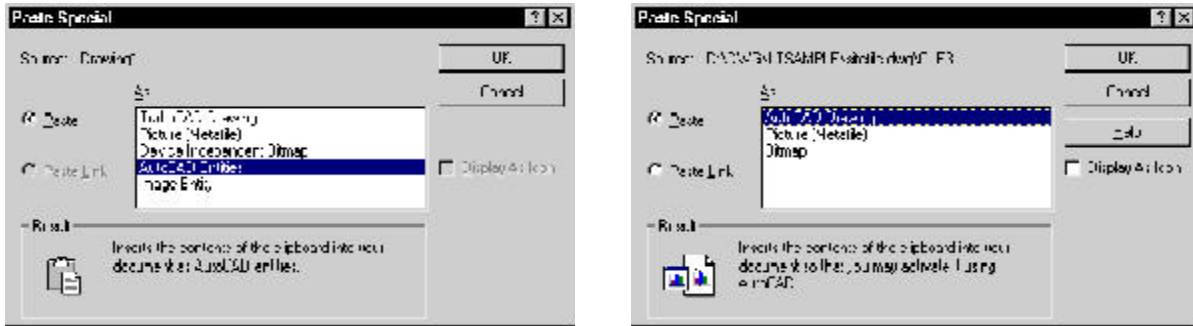
AutoCAD viewport in model space (Tilemode = 0)



Result after pasting in TurboCAD

Clipboard Paste Options

When you select the **Edit | Paste Special** command in any Windows application, the **PasteSpecial** dialog box provides you with these options:



The Paste Special dialog box in AutoCAD (left) and TurboCAD (right)

Paste Link

When you select the **Link** option, Windows maintains a link between the two CAD packages. When you update the drawing in the originating CAD package, Windows is supposed to automatically update the image of the drawing in the other CAD package. In practice, I find this rarely works. In addition, the link is easily broken by simply moving or renaming the file. While the paste-link feature has much potential, it is not worth the bother to use it.

You can only paste-link an AutoCAD drawing into a TurboCAD drawing and not the other way around. That's because TurboCAD does not provide send linking data to the Clipboard. The work around is to use TurboCAD's **Edit | Link** command, described in detail later in this lesson.

Icon

Sometimes, to save space, you are permitted to paste the object as an icon. This is a good solution when you are not interested in seeing the data, except when you click on the icon. You have the option to paste the drawing as an icon only when you select "AutoCAD Drawing" (or "TurboCAD Drawing") as the data format.



Drawing

AutoCAD drawing pasted as an icon

Pasted As

Depending on the Clipboard format you choose, each CAD package pastes the data in a different form. The format you paste it in determines whether you can *convert* the object or *edit* it. Sometimes you want to edit the object; other times, you'd prefer to just see but not change it. The next two columns show your options:

Convertible

The Clipboard data has been pasted in a format that the CAD package can convert into another file format. This conversion step is sometimes necessary before the object can be edited. AutoCAD is limited to converting the image to an icon.

Editable

The Clipboard data has been pasted in a format that the CAD package can edit. Often, this means that the object is edited using the other CAD package.

Paste Special Formats

The table below summarizes the Clipboard data formats each CAD package will paste into the drawing. indicates the operation is permitted:

Clipboard Format	Paste	Paste Link	Icon	Pasted As	Convert To	Edit
AutoCAD's Paste Special Command						
TurboCAD Drawing	<input checked="" type="checkbox"/>	...	<input checked="" type="checkbox"/>	OLE object	Icon	In situ ¹
Picture (metafile) ²	<input checked="" type="checkbox"/>	OLE object	Icon	...
DIB (raster bitmap)	<input checked="" type="checkbox"/>	OLE object	Icon	...
AutoCAD Entities ²	<input checked="" type="checkbox"/>	Block	...	Explode first
ImageEntity ³	<input checked="" type="checkbox"/>	Image object	...	In AutoCAD
TurboCAD's Paste Special Command						
AutoCAD Drawing	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Drawing	Icon	In situ
Picture (metafile)	<input checked="" type="checkbox"/>	Picture	Icon	...
Bitmap	<input checked="" type="checkbox"/>	Picture	Icon	...

¹ In situ means the object is edited in place but using the other CAD package.

² Pasting with the "Picture" format in AutoCAD is affected by the settings in the **WmfOpts** command.

³ The "Image Entity" is the Image object new to Release 14.

Clipboard Formats

When you copy (or cut) a large drawing to the Clipboard, it takes AutoCAD and TurboCAD several seconds to complete the command. The reason is that both CAD packages are busy translating the drawing into a dozen of more formats, which is then stored in the Windows Clipboard. The table below lists all of the data created by TurboCAD and AutoCAD.

There are two primary groups of Clipboard data: *public* and *private*. The public data is what you are allowed to use in another application. These are the formats that show up when you select **Edit | Paste Special**.

The private data is meant for the originating application and Windows. For example, **EmbedSource** tells Windows where the data came from. **Native** is the data in native format, such as AutoCAD's or TurboCAD's own file format; it is used when you paste back into the same drawing.

Clipboard Formats	TurboCAD	AutoCAD	Notes
Public			
Bitmap	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Raster image
DIB	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Device independent bitmap
EnhMetafile	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Enhanced metafile (vector)
Picture	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Windows metafile (vector)
Private			
AutoCAD.r14	...	<input checked="" type="checkbox"/>	Release 14 format.
DataObject	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Name of the data object.
Embed Source	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Name of the embedding source.
Link Source	...	<input checked="" type="checkbox"/>	Name of the link source.
Link Source Descriptor	...	<input checked="" type="checkbox"/>	Description of the link source.
Native	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Native file format.
Object Descriptor	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Name of the object.
Object Link	...	<input checked="" type="checkbox"/>	Link back to the object source.
Ole Private Data	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	OLE data used by native application.
OwnerLink	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Link back to the data source.
TC30DragRect	<input checked="" type="checkbox"/>	...	

Object Linking and Embedding

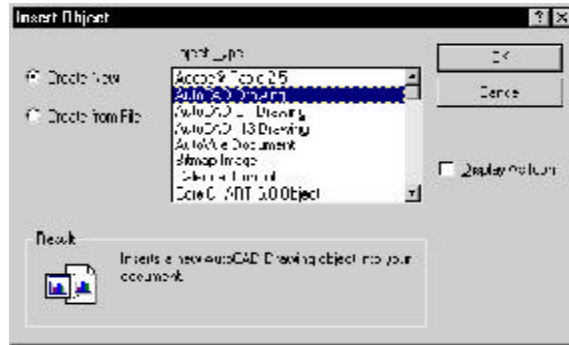
The subject of OLE (short for “object linking and embedding”) gets confusing because the name keeps changing. OLE began as DDE (short for “dynamic data exchange”), which was invented by IBM ten years ago for its OS/2 operating system. In the early 1990s, Microsoft added to DDE’s functionality and renamed it Object Linking and Embedding. A couple of years ago, Microsoft again added to OLE’s functionality and renamed it OCX (short for “object component extensions”). Last year, Microsoft again renamed the technology, this time giving it the more “exciting” name of ActiveX.

Despite four name changes in ten years, DDE-OLE-OCX-ActiveX does the same fundamental job: it provides a means for Windows applications to communicate data and commands with each other. The program providing the data is called the “server” since it is serving up data; the program receiving the data is called the “client” since it is on the receiving end.

Not all Windows programs can both send and receive OLE data. Those that can send are called “OLE Servers”; those that can receive are called “OLE Clients.” Those that do both are said to have “full OLE”; those that do neither aren’t called anything. Both AutoCAD Release 14 and TurboCAD Version 4 have full OLE for data.

In addition to sending and receiving data, OLE-aware programs should be able to send and receive commands. This allows one program to control another program. It is not documented but AutoCAD can receive commands via OLE; Autodesk is planning to add functionality to Release 14 that also allows it to send commands.

Even though OLE is quite complicated, for the user it is very simple to activate. In TurboCAD, you select **Insert | Object**; in AutoCAD, you select **Insert | OLE Object**. In either case, the following dialog box is displayed:



Insert Object dialog box

The dialog box gives you three options: (1) create a new object; (2) load or link an object from a file; and (3) place an icon.

Create New

When in AutoCAD, select “TurboCAD Drawing” from the list in **Object Type**. Windows launches TurboCAD with a blank screen. You create the new drawing in TurboCAD, then select **File | Update filename.Dwg** from the file menu. Windows transfers the data to AutoCAD. You can continue drawing in TurboCAD, updating the image back in AutoCAD from time to time. When finished in TurboCAD, select **File | Exit & Return to filename.Dwg** or you can continue working in TurboCAD on another drawing.

The process is almost identical for inserting an AutoCAD drawing in TurboCAD. The exceptions are:

- AutoCAD can only have one drawing open at a time. So, if AutoCAD is already running, Windows launches another copy. Since TurboCAD can open multiple drawing files, Windows merely opens a new, blank drawing when TurboCAD is already running.
- TurboCAD gets impatient waiting for AutoCAD to launch. It displays the following dialog box:



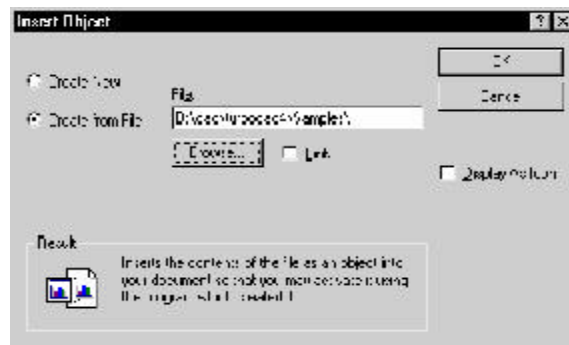
Dialog box displayed by TurboCAD waiting for AutoCAD to start

Wait for AutoCAD to completely finish loading, then click **Retry** in the **Server Busy** dialog box.

- When finished with drawing and editing in AutoCAD, you must exit AutoCAD. You cannot open another drawing or start a new drawing.

Create from File

The **Create from File** option reverses the above procedure: you select a filename, then Windows launches the associated application. Click the **Browse** button to locate the file. For example, in TurboCAD, select a DWG file. This causes AutoCAD to launch with that drawing.



Create from File option

If you see no drawing being loaded, it is because TurboCAD is displaying the **Server Busy** dialog box. You must click **Retry** before AutoCAD will load the drawing file. You may find it helpful to vertically tile the CAD programs; that way, you can see what's going on in both programs at the same time. To do this, right click on a blank spot on the task bar (usually along the bottom of your Windows screen). Windows displays a pop-up menu with several options, including **Tile Vertically**.



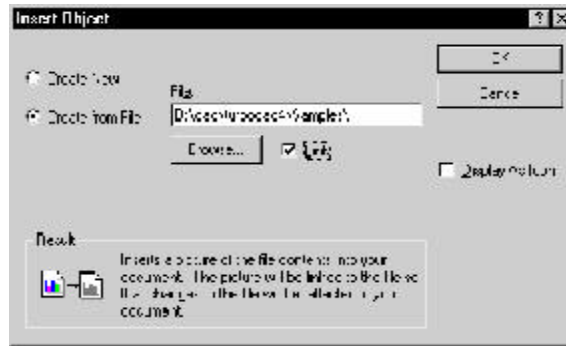
Tiling two applications vertically with the task bar menu

With the drawing loaded, you can edit or simply select **File | Update TurboCAD v4 Professional** to place the AutoCAD drawing in TurboCAD. The drawing is placed as an OLE object.

You cannot edit it in TurboCAD. Instead, you must select the drawing, then select **Edit | Drawing Object | Edit** (or, more simply, double-click the OLE object.) While the object is being edited in the source application, the destination application places a pattern of black diagonal lines over the object to indicate something is afoot.

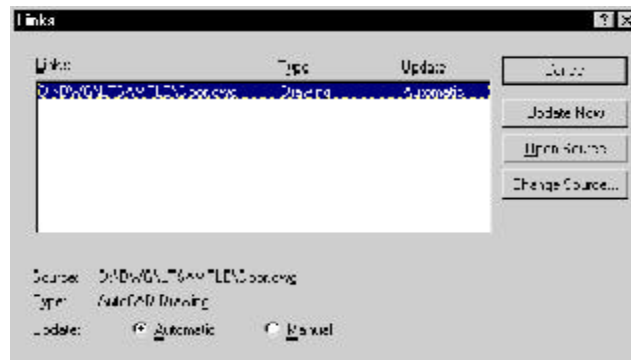
Link

When you select **Create from File**, Windows allows you to select the **Link** option. This is identical to the Clipboard link-paste mechanism described earlier in this chapter, but with a different user interface.



Link option

When an OLE object is placed with a link, you select **Edit | Links** to change the nature of the link. Both CAD programs display the following dialog box:



Links dialog box

The **Links** dialog box lets you update the originating file, open the source drawing, change the source of the drawing (useful when the link is broken), and change the **Update** between **Automatic** and **Manual**.

Display As Icon

If you just want ready access to the drawing but do not actually want to see it, then insert it as an icon. The advantage is that the display speed is much faster, than when a complicated drawing must be updated.



Display as Icon option

Summary

Using the Clipboard is the fastest way to transfer drawings and symbols between AutoCAD and TurboCAD. The drawback is a loss of accuracy, data, and control over the translation process.

Using OLE ensures that the object looks 100% accurate and is fully editable back in the source application. The drawback is a consumption of computer memory and slowdown of apparent computing speed.

Appendix A

Command Cross-reference

Equivalent AutoCAD Commands in TurboCAD

While the Windows interface makes it easier to learn how to use more than one CAD package, there are still differences between the commands used by AutoCAD and TurboCAD. This appendix lists cross-reference tables of commands and short-cut keystrokes:

- AutoCAD-TurboCAD commands
- Function keys
- Control keys
- Color numbers
- Keyboard shortcuts
- TurboCAD command names

AutoCAD-TurboCAD Commands

In the following page list (almost) all AutoCAD commands, along with their equivalent menu selection in TurboCAD. Excluded are commands specific to ASE (AutoCAD SQL Extension), ACIS solids modeling, Render, and commands specific to 3D drawing and editing within AutoCAD.

Some AutoCAD commands list two or more TurboCAD commands because the function of a single AutoCAD command is spread amongst two or more TurboCAD commands. Similarly, some TurboCAD commands perform the equivalent of several AutoCAD commands.

... means that an equivalent command is not available in TurboCAD.

Not required. means that the command exists due to a peculiarity of AutoCAD's; no similar command is required by TurboCAD.

AutoCAD R14	TurboCAD v4	TurboCAD Comments
<i>For this R14 command...</i>	<i>...select this menu item:</i>	
A		
ABOUT	Help About TurboCAD	
ACISIN	File Open	Select ACIS (*.SAT) option.
ACISOUT	File Save As	Select ACIS (*.SAT) option.
ALIGN	Format Align	Aligns object along a line or to selection window.
APERTURE	View Cursor Aperture	TurboCAD's aperture cursor is round.
APPLOAD	Tools Run Script	Scripts are written in BASIC.
ARC	Insert Arc	Also draws elliptical arcs.
Start pt, Second pt, End pt	Start/Included/End	
Start pt, Center pt, End pt	Double Point Arc	
Start pt, Center pt, Angle	Center and Radius	
Start pt, Center pt, Chord	...	No chord length available.
Start pt, End pt, Angle	Double Point Arc	
Start pt, End pt, Direction	...	Direction vector not available.
Start pt, End pt, Center pt	Center and Radius	
Center pt, Start pt, End pt	Center and Radius	
Center pt, Start pt, Angle	Center and Radius	
Center pt, Start pt, Chord	...	No chord length available.
Tangent to last arc	Tangent to Arc	

Tangent to last line <i>For this R14 command...</i>	Tangent to Line <i>...select this TurboCAD menu item:</i>	
AREA	Tools Measurement Area	
ARRAY R	Edit Copy Entities Array	Rectangular array.
ARRAY P	Edit Copy Entities Radial	Polararray.
ARX	Tools Run Macro	
ATTDEF	Tools Database Define Fields	
ATTDISP	...	Attributes are not displayed.
ATTEDIT	Tools Database Edit Object Data	
ATTEXT	Tools Database Report	
ATTREDEF	Tools Database Edit Object Data	
AUDIT	...	Not required.
B		
BASE	Modes Coord System Relocate Origin	
BHATCH	Insert Path Hatching	
BLIPMODE	...	TurboCAD does not create blips.
BLOCK	Format Create Block	
BMAKE	Format Create Block	
BMPOUT	...	Does not export in raster formats.
BOUNDARY	...	
BREAK	Modify Split	
BROWSER	...	Launch browser from Windows desktop.
C		
CAL	...	Use Windows Calculator utility.
CHAMFER	Modify Chamfer	
CHANGE	Edit bar	Select object first.
CHPROP	Edit bar	Select object first.
CIRCLE	Insert Circle/Ellipse	
Radius	Center and Point	
Diameter	...	Circle by diameter not available.
2P (Two points)	Double Point	
3P (Three points)	Triple Point	

TTR (tangent, tangent, radius)	Tangent to 3 Arcs	
<i>For this R14 command...</i>	<i>...select this TurboCAD menu item:</i>	
COLOR or COLOUR	Propertiestoolbar	
COMPILE	...	Does not read SHP/SHX files.
CONVERT	...	Not required.
COPY	Edit Copy Entities Linear	Multiple copy is default option.
COPYCLIP	Edit Copy	
COPYHIST	...	Does not have a text screen.
COPYLINK	Edit Copy	
CUTCLIP	Edit Cut	
D		
DBLIST	View Selection Info	Select objects first.
DDATTDEF	Tools Database Define Fields	
DDATTE	Tools Database Edit Object Data	
DDATTEXT	Tools Database Report	
DDCHPROP	Edit bar	Select object first.
DDCOLOR	Propertiestoolbar	
DDEDIT	Format Properties	Select text first.
DDGRIPS	Edit NodeEdit	
DDIM	Format Properties	Select dimension first.
DDINSERT	View Blocks View Symbol Palette	
DDMODIFY	Format Properties	Select object first.
DDPTYPE	Insert Point ...	Dot, star, square, cross, and circle.
DDRENAME	...	Rename objects in related dialog boxes.
DDRMODES	Options Drawing Setup	
DDSELECT	...	Not required in TurboCAD.
DDUNITS	Options Drawing Setup Units and Scale	
DDVIEW	View Named View	

DELAY	...	Available in script BASIC.
<i>For this R14 command...</i>	<i>...select this TurboCAD menu item:</i>	
Dimensions		
DIM	Insert Dimension	
DIMALIGNED	Insert Dimension Parallel	Dimension is aligned parallel to object.
DIMANGULAR	Insert Dimension Angular	
DIMBASELINE	Insert Dimension Baseline	
DIMCENTER	...	Use Dimension Diameter and erase dimension.
DIMCONTINUE	Insert Dimension Continue	
DIMDIAMETER	Insert Dimension Diameter	
DIMEDIT	Format Properties	Select dimension first.
DIMLINEAR	Insert Dimension Horizontal Insert Dimension Vertical	
DIMORDINATE	Insert Dimension Datum	
DIMOVERRIDE	Edit bar and Properties toolbar	Select dimension first.
DIMRADIUS	Insert Dimension Radius	
DIMSTYLE	Format Properties	
DIMTEDIT	Format Properties	Select dimension first.
DIST	Tools Measurement Distance Tools Measurement Angle	
DIVIDE	Edit Copy Entities Fit Linear Edit Copy Entities Fit Radial	Operates independent of divided object.
DONUT	...	Draw concentric circles and fill.
DRAGMODE	...	Not required.
DRAWORDER	Format Bring to Front Format Send to Back	
DSVIEWER	View Aerial View	
DTEXT	Insert Text	
DWFOUT	File Save As	Drawing Web Format (*.DWF)
DXBIN	...	Use File Trace instead.
DXFIN	File Open	Drawing eXchange Format (*.DXF)

DXFOUT <i>For this R14 command...</i>	File Save As <i>...select this TurboCAD menu item:</i>	Drawing eXchange Format (*.DXF)
--	---	---------------------------------

E

ELLIPSE	Insert Circle/Ellipse	
ERASE	Edit Clear	Or, press Delete key.
EXPLODE	Modify Explode	
EXPORT	File Save As	
EXTEND	Modify Shrink/Extend Line	

F

FILL	Format Properties Brush Pattern	
FILLET	Modify Fillet	
FILTER	Edit Select By Query	

G

GRAPHSCR	...	No text screen.
GRID	View Grid	
GROUP	Format Create Group	

H

HATCH	Insert Path Hatching	
HATCHEDIT	Format Properties	Select hatch first.
HELP	Help TurboCAD Help Topics	

I

ID	Tools Measurement Coordinates of the Point	
IMAGE	Insert Picture	
IMAGEADJUST	...	No image adjustment.
IMAGEATTACH	Insert Picture	Imports WMF and BMP (DIB).
IMAGECLIP	...	No image clipping.
IMAGEFRAME	...	No image frame toggling.
IMAGEQUALITY	...	No image adjustment.
IMPORT	File Open or Ctrl+O	

INSERT	View Symbols Palette or View Blocks	
<i>For this R14 command...</i>	<i>...select this TurboCAD menu item:</i>	
INSERTOBJ	Insert Object	
ISOPLANE	...	
L		
LAYER	Options Layers	
LEADER	Insert Dimension Leader	
LENGTHEN	Modify Line Length	
LIMITS	View Margins	
LINE	Insert Line Single	
	Insert Line Multiline	Multi-segment line.
LINETYPE	Property toolbar.	Select object first.
LIST	View Selection Info	Select objects first.
LOAD	...	Does not read SHP/SHX files.
LOGFILEOFF	...	No log file.
LOGFILEON	...	No log file.
LTSCALE	Format Properties Pen Dash Scale	
M		
MATCHPROP	...	
MEASURE	Edit Copy Entities Linear	
MENU	Options Toolbars and Menus	
MENULOAD	Options Toolbars and Menus	
MENUUNLOAD	Options Toolbars and Menus	
MINSERT	...	Insert block, then array.
MIRROR	Edit Copy Entities Mirror	
MLEDIT	Modify T-Meet 2 Double Lines	Select double lines first.
	Modify Intersect 2 Double Lines	
MLINE	Insert Double Line	Two parallel lines only.
MLSTYLE	Format Properties	Select double line first.
MOVE	...	Select object and drag.
MSLIDE	...	No support for SLD files.

MSPACE	...	Click paper space icon.
<i>For this R14 command...</i>	<i>...select this TurboCAD menu item:</i>	
MTEXT	Insert Text	
MULTIPLE	...	Automatic default in TurboCAD.
MVIEW	Insert Viewport	
MVSETUP	File Page Setup Wizard	
N		
NEW	File New <i>or</i> Ctrl+N	
O		
OFFSET	Insert Line Parallel	Also available for double line.
	Insert Circle Concentric	Also available for arc.
OLELINKS	Edit Links	
OOPS	Edit Undo	
OPEN	File Open <i>or</i> Ctrl+O	
ORTHO	Modes Snaps Ortho	
OSNAP	Modes Snaps	
Apparent intersection	Intersection	
Center	Arc Center	
	Vertex	
Endpoint	Vertex	
Insertion point	...	
Intersection	Intersection	
Midpoint	Middle Point	
Nearest	Nearest on Graphic	
Node	Vertex	
None	No Snap	
Quadrant	Quadrant Point	
Perpendicular	Insert Line Perpendicular	Also available for double line.

Tangent	Insert Line Tangent	Also available for double line, circle, and arc.
<i>For this R14 command...</i>	<i>...select this TurboCAD menu item:</i>	
P		
PAN	View Vector Pan	
PASTECLIP	Edit Paste	
PASTESPEC	Edit Paste Special	
PEDIT	Edit bar.	
PLINE	Insert Line Multiline or Insert Curves Bezier	
PLOT	Edit Print or Ctrl+P	
POINT	Insert Point	
POLYGON	Insert Line Polygon	
PREFERENCES	Options Program Setup	
PREVIEW	Edit Page Setup	
PSDRAG	...	Not required.
PSFILL	...	
PSIN	File Open or Ctrl+O	Select Encapsulated Postscript (*.EPS).
PSOUT	File Save As	Select Encapsulated Postscript (*.EPS).
PSPACE	...	Click on world space icon.
PURGE	...	Not required.
Q		
QSAVE	File Save or Ctrl+S	
QTEXT	...	Not required.
QUIT	File Exit	
R		
RAY	Insert Construction	
RECOVER	...	Not required.
RECTANG	Insert Line Rectangle	
REDEFINE	Options Toolbars and Menu	
REDO	Edit Redo	
REDRAW	View Redraw	
REDRAWALL	...	

REGEN	...	Not required.
REGENALL	...	Not required.
<i>For this R14 command...</i>	<i>...select this TurboCAD menu item:</i>	
REGENAUTO	...	Not required.
REGION	...	
REINIT	...	Not required.
RENAME	...	Rename in related dialog boxes.
RESUME	...	Use script BASIC.
ROTATE	...	Select object and drag.
RSCRIPT	Tools Run Scripts
S		
SAVE	File Save or Ctrl+S	
SAVEAS	File Save As	
SAVEIMG	...	No raster export; use Clipboard.
SCALE	...	Select object and drag.
SCRIPT	Tools Run Scripts	...
SELECT	Edit Select Entity Type	...
SETVAR	...	
SHAPE	...	TurboCAD does not support SHP files.
SHELL	...	Switch to Windows desktop.
SKETCH	Insert Curve Sketch	...
SNAP	Options Grid	
SOLID	...	Use solid fill hatch pattern.
SPELL	...	
SPLINE	Insert Curves Spline	
SPLINEDIT	Node Edit	
STATUS	...	
STRETCH	Modify Stretch	...
STYLE	...	Click Style list box.
SYSWINDOWS	Window	
T		
TABLET	No support for tablets.

Appendix A Command Cross-reference

TEXT	Insert Text	
TEXTSCR	...	No text screen.
<i>For this R14 command...</i>	<i>...select this TurboCAD menu item:</i>	
TIME	...	
TOLERANCE	...	
TOOLBAR	View Toolbars	
TRACE	...	Set Width in Properties dialog box.
TREESTAT	...	
TRIM	Modify Object Trim	
U		
U	Edit Undo	
UNDEFINE	Options Toolbars and Menus	
UNDO	Edit Undo	
UNITS	Options Units and Scale	
V		
VIEW	View Named View	
VIEWRES	...	
VPLAYER	...	
VPORTS or VIEWPORTS	Insert Viewports	
VSLIDE	...	
W		
WBLOCK	View Symbols Palette	
WMFIN	File Open	Select Windows Metafile (*.WMF).
WMFOPTS	File Open	Select Setup.
WMFOUT	File Save As	Select Windows Metafile (*.WMF).
X		
XATTACH	...	
XBIND	...	
XCLIP	...	

XLINE	Insert Construction	Construction lines and circles.
XREF	...	
<i>For this R14 command...</i>	<i>...select this TurboCAD menu item:</i>	

Z

'ZOOM	View Zoom
Center	Zoom In
Window	Zoom Window
Extents	Extents
Limits	Full View
1.0xp	Printed Size

Function Keys

Function Keys	AutoCAD R14	TurboCAD v4
F1	Help	Help.
F2	Text-graphics window	...
F3	Display OSnap dialog box.	...
F4	Tablet mode	...
F5	Isoplane toggle	Redraw current viewport.
F6	Coordinate toggle	Select first-drawn object.
F7	Grid display	Select last-drawn object.
F8	Ortho toggle	...
F9	Snaptoggle	...
F10	Menu bar	Menu bar.
Ctrl+F4	Close drawing	Close drawing.

Control Keys

Control Keys	AutoCAD R14	TurboCAD v4
Ctrl+A	Group toggle	Select All.
Ctrl+B	Snap toggle	...
Ctrl+C	Copy to Clipboard	Copy to Clipboard.
Ctrl+D	Coordinate toggle	A, P, and R
Ctrl+E	Isoplane toggle	...
Ctrl+G	Grid display	...
Ctrl+I	...	Display Attribute dialog box.
Ctrl+K	...	Display Color dialog box.
Ctrl+L	Ortho toggle	Display Layer dialog box.
Ctrl+O	Open file	Open file.
Ctrl+P	Print drawing	Print drawing.
Ctrl+Q	Open and close log file	...
Ctrl+R	Switch to next viewport	...
Ctrl+T	Tablet mode	...
Ctrl+S	Save drawing	Save drawing.
Ctrl+V	Paste from Clipboard	Paste from Clipboard.
Ctrl+X	Cut to Clipboard	Cut to Clipboard.
Ctrl+Y	Redo	Redo.
Ctrl+Z	Undo	Undo.

Color Numbers

Color Number	AutoCAD R14	TurboCAD v4
0	Background color	...
1	Red	No color.
2	Yellow	Black
3	Green	Red
4	Cyan (light blue)	Green
5	Blue	Blue
6	Magenta (pink)	Yellow
7	White (or black)	Cyan (light blue)
8	Grey	Magenta (pink)

Keyboard Shortcuts

Shift Keys	AutoCAD R14	TurboCAD v4
Shift+A	Ctrl+D	Display absolute coordinates.
Shift+C	...	Center of arc object snap.
Shift+D	...	Relocate reference point.
Shift+G	Ctrl+G	Snap to grid.
Shift+H	...	Snap opposite.
Shift+I	...	Intersection object snap.
Shift+L	...	Relocate origin.
Shift+M	...	Midpoint object snap.
Shift+N	Snap to nearest.
Shift+O	Ctrl+O	Snap ortho.
Shift+P	Ctrl+D	Display polar coordinates.
Shift+Q	...	Quadrant object snap.
Shift+R	Ctrl+D	Display relative coordinates.
Shift+S	F3	Turn object snap off.
Shift+V	...	Vertex object snap.
Shift+W	...	Show magnetic point.
Shift+X	.xy	Lock x-coordinate (.xz point filter).
Shift+Y	.yz	Lock y-coordinate (.yz point filter).
Del	Delete	Erase selected objects.
Esc	Esc	Cancel command in progress.

TurboCAD Command Names

TurboCAD Command Name	Shortcut Keystroke	Meaning
ViewZoomExtents	Ctrl+Back	View all elements as large as possible.
ViewFocusToEditBar	Ctrl+E	Set input focus to edit bar.
ViewPanToCursor	Ctrl+End	Pan window to a selected point.
EditSelectByOrderAndNodeEdit	Ctrl+F6	Select next object in draw order for node editing.
EditSelectByReverseOrderAndNodeEdit	Ctrl+F7	Select next object in reverse order for node editing.
EditSelectByAttribute	Ctrl+I	Select all entities with a specific info string.
EditSelectByColor	Ctrl+K	Select all entities with a specific color.
EditSelectByLayer	Ctrl+L	Select all entities on the active layer.
EditSelectByName	Ctrl+M	Select all blocks and groups with a specific name.
FileNew	Ctrl+N	Create a new drawing.
FileOpen	Ctrl+O	Open an existing drawing.
FilePrint	Ctrl+P	Print the active drawing.
ViewFocusToStatusBar	Ctrl+R	Set input focus to status bar.
FileSave	Ctrl+S	Save the active drawing.
EditPaste	Ctrl+V	Insert Clipboard contents.
EditCut	Ctrl+X	Cut the selection and put it on the Clipboard.
EditRedo	Ctrl+Y	Redo the previously undone action.
EditUndo	Ctrl+Z	Undo the last action.
EditClearSelection	Delete	Erase the selection.
ViewScrollDown	Down	Scroll view down.
EditCancel	Esc	Cancel the current procedure.
ViewRedraw	F5	Redraw the active view.
EditSelectByOrder	F6	Select next object in draw order.
EditSelectByReverseOrder	F7	Select next object in back order.
ModesSnapSingleGrid	G	Single snap to the nearest grid point.
ModesSnapSingleMirror	H	Single snap to the mirror point.
ViewScrollHome	Home	Scroll view home.

TurboCAD Command Name	Shortcut Keystroke	Meaning
ModesSnapSingleIntersection	I	Single snap to the intersection of two objects.
ModesSnapSingleProjection	J	Single snap to the projection point.
ViewScrollLeft	Left	Scroll view left.
ModesSnapSingleMiddlePoint	M	Single snap to the midpoint of a line.
ModesSnapSingleNearestOnGraphic	N	Single snap to the nearest point.
ViewZoomInByCursor	Num +	Zoom in one step about cursor position.
ViewZoomOutByCursor	Num -	Zoom out one step about cursor.
ViewCursorMoveDown	Num 2	Move cursor one step down.
ViewCursorMoveLeft	Num 4	Move cursor one step left.
ViewCursorMoveRight	Num 6	Move cursor one step right.
ViewCursorMoveUp	Num 8	Move cursor one step up.
ModesSnapSingleQuadrantPoint	Q	Single snap to quadrant point of an arc.
ViewScrollRight	Right	Scroll view right.
ModesSnapSingleNoSnap	S	No snap at all, get the mouse position.
ViewZoomFullView	Shift+Back	Fit the page(s) in the window.
HelpContext	Shift+F1	Display help for clicked buttons, menus, and window.
EditAddToSelectionByOrder	Shift+F6	Select next object in draw order and add to current selection.
EditAddToSelectionByReverseOrder	Shift+F7	Select next object in reverse order and add to current selection.
ModesCoordinateRelocate	Shift+L	Relocate relative/polar origin.
ViewScrollUp	Up	Scroll view up.

Appendix B

TurboCAD-AutoCAD Dictionary

Understanding the TurboCAD Jargon

TurboCAD Term	Equivalent AutoCAD Meaning
Active	Current.
Attribute	Extended entity data.
Block	Same as a block in AutoCAD.
Brush Pattern	The pattern that fills an area. TurboCAD can have fills and hatches.
Construction line	Xline.
Dot	Point.
Double Point Circle	Circle 2P command.
Edit bar	Direct distance entry.
Editable layer	Unlocked layer.
Fit array	Array.
Group	Same as a group in AutoCAD.
Hatch	Vector hatching pattern, as in AutoCAD; creates an independent hatch object.
Line style	Linetype.
Local menu	Cursor menu.
Locked coordinates	Point filters.
Magnetic point	AutoSnap magnet.

TurboCAD Term	Equivalent AutoCAD Meaning
Major grid	Grid
Minor grid	A subdivision of the grid.
Multiline	Multi-segmentline.
Node	Handle.
Not visible layer	Off, frozen layer.
Order	Draw order
Path Hatching	Hatching applied to an area defined by a series of picked points.
Pen	The color, width, and style of lines.
Pen style	Linetype.
Polyline	Multi-segmentline.
Propertiestoolbar	Object Properties toolbar.
Read-only layer	Locked layer.
Rubber stamp	Copy multiple.
SEKE	Alias.
Snap mode	Object snap mode.
Split	Break.
Style	Predefines properties for an object. Whereas in AutoCAD, you predefine properties for text (using the Style command), TurboCAD can create named styles for any object.
Symbol	Unlike a block (which is referenced), a symbol is copied.
Template drawing	Prototype or template drawing; default settings are stored in TCW40.Ini.
Three Point Circle	Circle 3P command.
Unblock	Explode.
Vector pan	Pan.
Visible layer	On, thawed layer.
Work space	Model space.

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