



PDHonline Course G176 (5 PDH)

2006 Minimal AutoCAD®

Instructor: Thomas Mason, P.E.

2020

PDH Online | PDH Center

5272 Meadow Estates Drive
Fairfax, VA 22030-6658
Phone: 703-988-0088
www.PDHonline.com

An Approved Continuing Education Provider

2006 Minimal AutoCAD®

Thomas Mason, P.E.

Course Content

Course Introduction

This course is separated into sections, explanatory notes, use of AutoCAD commands, exercises to build confidence and appendices. If you are seeking immediate value and answers to the quiz questions so you can renew your license, please go to the commands without delay. If your learning style requires that you understand what is going on “behind the curtain”, then please read the explanatory narratives.

<i>Explanatory Narrative</i>	<p>By logic, you know that the drawing tools in Microsoft Word®, VISIO®, Corel®, Adobe® and MicroStation® must have common elements - lines, circles, polygons and text.</p> <p>Why, then, is each program so difficult to learn and use and why does AutoCAD - creating the same lines, circles, polygons and text - have the reputation of being difficult to learn and use?</p> <p>After decades of observation and rumination, your author has concluded that someone at each firm likes the way they have done it.</p> <p>Are they right? Your author thinks not. A few commands, each, for lines, circles, polygons and text, along with a few editing commands and some file handling commands and some printing commands should be all we need. Yes, there are times when special features will help, but a usable help utility ought to remove the pain from these special times.</p> <p>[Why don't they provide usable help utilities for Microsoft Word®, VISIO®, Corel®, Adobe®, MicroStation®? Your author has concluded that someone at each firm likes the way they have done it.]</p> <p>To constructively respond to this heretical thinking, your author has extracted the minimal commands from AutoCAD and presents them here.</p>
------------------------------	--

<i>Explanatory Narrative</i>	<p>WARNING: There are different versions of AutoCAD, which use slightly different commands.</p> <p>Your author has used Ver 9, 12, 14, 2000, 2002, 2003, 2004, 2005 and 2006. Between ver 12 and 14 AutoCAD changed the “terminate present command” function from ^C (control C) to ESC (escape).</p> <p>One of the good things about AutoCAD has always been the continuity of commands. Many commands keep doing what they do until you hit ESC or RET (return). In ver 2005, ESC cancels the last action and terminates, but RET keeps the last action and terminates. This can be painful when editing text and frequently changing between 2002 and 2005 machines.</p> <p>The command continuity function must be watched closely. MicroStation® convention is to keep-doing-what-you-are-doing much more than AutoCAD. MicroStation® claims higher productivity, so AutoCAD is adding this feature to more commands with each release. In ver 2004 the COPY command began keep-going. That is, you say, “COPY” and you pick something to copy, but it keeps trying to lay down that object until you say ESC or RET. Previously, you got only one copy from the command.</p>
------------------------------	--

<i>Explanatory Narrative</i>	<p>Avoid icons and menus (except property manager, change display color and insert raster). They keep changing, and they aren't very descriptive.</p> <p>By actual test, all of the available toolbars will completely cover the workspace on the AutoCAD screen. If you keep open half the toolbars, you get about half the screen to use to draw and edit. If you turn them all off, you get almost the whole screen to use to draw and edit.</p> <p>The menus are a long way from intuitive.</p> <p>The property manager is accessible under the MODIFY menu item, then PROPERTIES. It is a table which shows forced values. For unknown reasons, some drafters force all lines to blue. You have to access the property manager and change it to BYLAYER. We will talk later about properties and layers. When the system is in out-of-the-box condition, there are no problems.</p> <p>Change display color is under the menu TOOLS / OPTIONS / DISPLAY. Normally AutoCAD operates with a black background,</p>
------------------------------	--

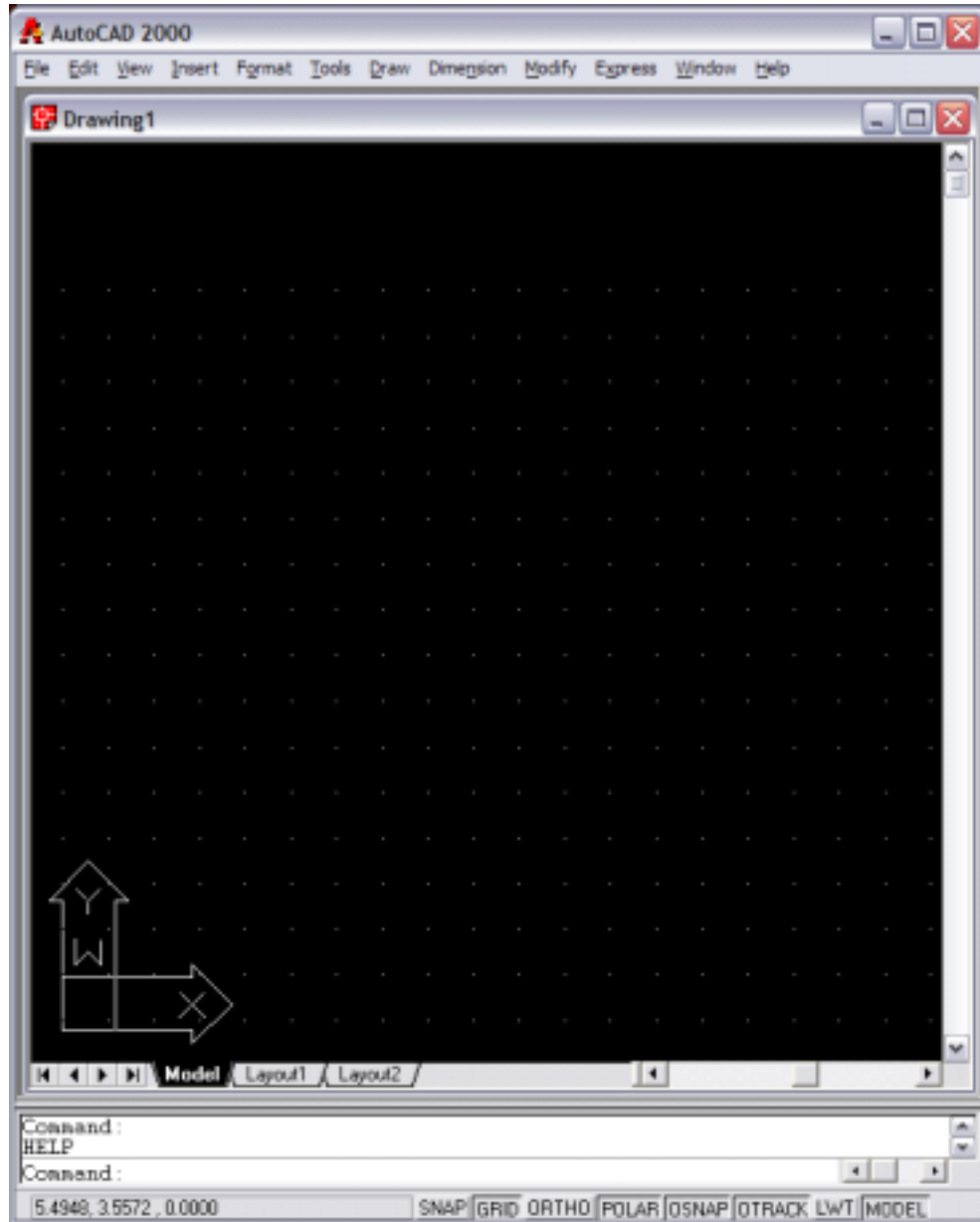
	<p>but you need a white background to cut-and-paste into other documents.</p> <p>Insert raster is under the menu INSERT / IMAGE. It will accept BMP(bitmap), JFIF(jpeg), PCX(paint), TIF(fax) and a few other formats. The command line equivalent is IMAGEATTACH.</p>
--	--

<i>Explanatory Narrative</i>	<p>Avoid system variables (except imageframe and textfill)</p> <p>In the early versions of AutoCAD, many characteristics of the program were set by system variables. They were never well documented and are not even mentioned in some books or help files. They still exist, and more have been added. However, almost all can be safely ignored.</p> <p>The two listed are needed to fix sabotaged drawings that you sometimes encounter. If imageframe = 0, then photographs cannot be moved or deleted. When you encounter this problem, change imageframe = 1. Say, "imageframe <RET>". The machine asks if you want 0 or 1. Say, "1 <RET>".</p> <p>When all large text comes out as outlines only, then change textfill = 1 for solid letters. Say, "textfill <RET>". The machine asks if you want 0 or 1. Say, "1 <RET>".</p>
------------------------------	--

<i>Explanatory Narrative</i>	<p>Getting and installing AutoCAD are beyond the scope of this course. Our assumption is that there is a functioning AutoCAD station where you can sit down, access needed drawings and plotter and do your work.</p> <p>In the days of ver 9, AutoCAD fit on a single 360K floppy. This continued through ver 14 (if you left out some supplementary files). The ver 2005 comes on 2-600M CD's. If you are lucky, you can use the AUTORUN on the CD and enter the license number when requested. I have not met anyone who is lucky. They have all needed IT support, usually involving calls to the manufacturer.</p> <p>The good news is - after the initial install, AutoCAD remains stable and functional. Occasional upgrades and patches make invisible internal changes and usually change how the plotted output looks.</p>
------------------------------	--

Start a Drawing Commands

In this section we will show how to the meanings of new, template, open, grid, snap, osnap, polar, pan, insert image, model space, paper space and the layer manager.



I start AutoCAD by clicking on the AutoCAD icon on my desktop. I get a large black workspace with a small pair of X-Y arrows (User coordinate system icon) at the lower left [similar to above]. (These arrows do not plot or transfer to the clipboard, but do transfer if you do a screenprint.)

<i>Explanatory Narrative</i>	If you open AutoCAD and find a real mass of toolbars and loose icons, you can remove them by right-clicking on the border of each and un-checking on the menu that appears. I go through all of them to leave a black workspace. This will persist on the machine. The next user, who really likes all the little icons, will complain. There is no return capability; he has to turn them on individually.
------------------------------	---

At the very top, I have an unreadable icon on a wasted line which says “Autodesk Building Systems 2005.” There is a set of the standard Microsoft Full-Screen, Tiled-Screen, Minimize, Close boxes on the top right. I use Tiled-Screen because I copy a lot into and out of external documents.

The next line on my screen is 13 top-level menus (12 on the ver 2000 shown). FILE is useful for new, open, save, saveas and send. The rest of the FILE menu and the other menus are for exploration at some unspecified future date.

The next line on my screen is an unreadable icon and “Drawing1.dwg”. Again, there is a set of the standard Microsoft Full-Screen, Tiled-Screen, Minimize, Close boxes on the right. I use Tiled-Screen because I copy a lot between drawings in a set and from reference drawings from other jobs.

<i>Explanatory Narrative</i>	<p>The good news is that AutoCAD, out-of-the-box, permits you to open up to 30 drawings simultaneously. This is super for updating title blocks before issue, and other repetitive chores.</p> <p>The bad news is that some utilities will not run in multi-document mode. Therefore, if the powers-that-be have mandated the utilities, then multi-document-mode is unavailable. You can only open one drawing at a time. Sometimes you can open multiple sessions of AutoCAD, though, and simplify copying.</p> <p>By the way, the clipboard contents persist when you close one drawing and open another. So, you can still copy between drawings in single document mode.</p>
------------------------------	---

The black workspace on my screen has white dots at 1/2-in spacing. This is called grid. You turn it on by saying, “GRID <RET> ON”. After you say, “GRID <RET>”. You get choices of ON, OFF and spacing. I always change it to .25” (1/4-in).

If you follow my lead and set GRID to .25”, you may get a warning, “Grid too dense to display.” To fix this, you zoom in at the origin, 0,0. The coordinate position of the cursor is shown on the lower left corner of the screen. Move the cursor until you seem something close to 0,0 and hit Z<RET> W<RET>. (This gives you ZOOM to a space selected by a cursor WINDOW.) Do a cursor

window around the origin and the screen should refresh to many, closely spaced dots. And, you get the COMMAND prompt back.

Do it again until you get reasonably spaced dots, maybe 1/2-in c-c. If the whole thing seems to be getting out of control, try Z<RET> .5x<RET> or Z<RET> 2x <RET>. This is a straight zoom-out, zoom-in command.

You can move the workspace in your window around using the scroll bars, the command P<RET> (PAN) and drag it with the mouse, or by pressing the scroll wheel on your mouse and dragging.

<i>Explanatory Narrative</i>	If you don't have scroll bars, you can get them under menu TOOLS /OPTIONS / DISPLAY / checkbox for scroll bars. If you go there, consider increasing your crosshair size to 100%. It makes it easier to line up copies of objects by eye.
------------------------------	---

This is a good time to do SNAP<RET> .125. This sets snap to 1/8-in, on grid points and halfway between the grid points. When you turn SNAP on, the only permitted cursor positions are on grid points and half-way between grid-points. Very nice for lining up a row of terminals or emergency generators.

The line below my workspace has a horizontal scrollbar and tabs for "Model" and "Work" (Model, Layout1 and Layout2 on the screenprint at the beginning of the section). For production (large building foundations, etc) most work is done in model space and the reproduction frame and text are placed in paper space. You look through a window from paper space into model space. You can work through the window or go directly into model space, where the walls and rebar and pavement and contour lines are.

This sounds complicated, but permits great flexibility in working on the project in model space, without worrying about plotting. It permits great flexibility in working on details of the presentation, title block, text notes, etc, in paper space. The greatest joy is that paper space is always 1:1 (what you see is what you get) but paper space permits zooming in and out. That is, you can have one window into model space at wide-angle, showing the entire range of the project with other windows zooming into individual door plans, or whatever. The windows and zoom ratios can be changed dynamically. The only problem is getting the right scale on the key plan and for each detail.

Below the horizontal scrollbar and model and paper space tabs, I have a large wasted line with some odd text and icons. They don't mean anything to me and I can't turn them off. (The wasted lines do not appear on the older ver. This kind of "improvement" is the reason I always reject offer for free patches and upgrades.)

Below that wasted line are three lines of command history. You can get a full popup screen of command history by hitting F2. (Turn off by hitting F2 again.) Cut-and-paste works, so that you can identify properties using the LIST command and apply them to another object using CHPROP. Or, you could simply use MATCHPROP without checking what is going on. More on this later.

The bottom line on my screen has the cursor coordinates and 8 buttons for features you might want. We will look at SNAP, GRID, POLAR, OSNAP and MODEL.

The initial screen just described was the result of a template, ACAD.dwt. A template of this name is supplied with AutoCAD by the manufacturer, but is usually modified by the installer to try to match what is done at the client office. My screen was set up with grid at 10-ft, just right for a civil engineer. (The ver. 2000 from the screenprint was set up for grid at 1/2-in, good for an electrical engineer. I modify any system I am sitting in front of for details grid at 1/2-in.)

<i>Explanatory Narrative</i>	<p>For many revisions, AutoCAD started a new drawing by opening ACAD.dwg. Ordinary persons could modify this base drawing and understood what they were getting. (This is back when AutoCAD worked off a local machine and kept files on the local hard drive. Today the executable code is usually on the local machine, but all drawing files are on LAN servers, where they get backed up each night.)</p> <p>Anyway, you had a base drawing that you kept current with the layers you commonly used and a standard title block, and sometimes some standard details or notes that were required on almost every job.</p> <p>AutoCAD.dwg is no longer part of the AutoCAD package, but I still have several old base drawings. I use them to collect special details I expect to use again and real good things I find on foreign drawings, that I might like to use on mine, like sexy north-arrows or scale bars.</p>
------------------------------	--

The contortions with GRID and SNAP and ZOOM and PAN do not have to be repeated each time. This would be a good time to save as Drawing1.dwg as MyDwg-1-8.dwg. This references the fact that we changed to a 1/2-in grid and 1/8-in snap. Note carefully where AutoCAD wants to save the drawing. You may prefer to put it in My Documents on C:\. SAVEAS is better than SAVE. You don't get a chance to see what the machine is doing or modify the destination with SAVE.

POLAR is a new command, since ver 14, that makes drawing a pleasure for persons with astigmatism. With POLAR turned on, the machine tries to draw straight lines at 0, 30, 45, 60 and 90 degrees in all four quadrants. It will draw lines at some intermediate values, but not if they are close to a regular angle. To do that you have to turn off POLAR.

When I edit drawings prepared by skilled draft persons, I note that they do almost all lining up by eye. Spacing between identical units varies and text doesn't line up horizontally or vertically. The visual aspect of such drawings is disturbing to me. I use GRID, SNAP and POLAR.

<i>Explanatory Narration</i>	Why would you want to insert a picture into an AutoCAD drawing? 1) To plot it big - 24"x36". 2) To crosshatch-out the pieces which must be demolished. 3) To box-in pieces which must be installed 4) To get a graphic sheet with instructions, that you can e-mail
----------------------------------	---

You insert an image by saying, IMAGEATTACH, or menu INSERT \ IMAGE, then choosing the .jpg file (for instance), choosing the location (insertion point) scale and rotation. It often works the first time, but you can say U<RET> to undo an insertion and start over.

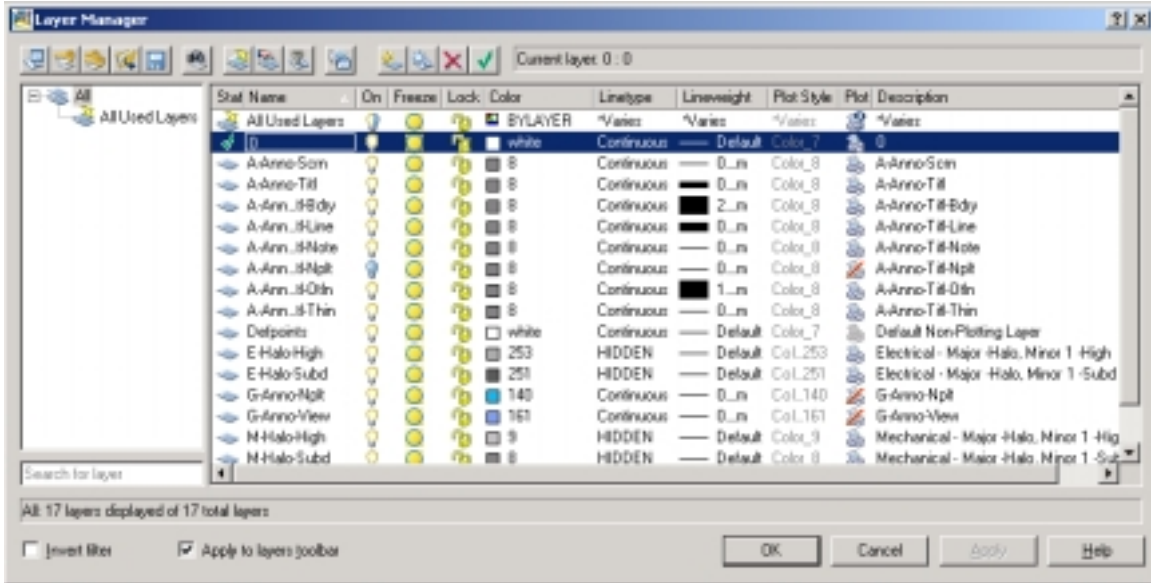
The values for insertion point, and scale are usually unimportant. There are many ways to zoom to make it the size you want and pan to place it where you want. Rotation is used for pictures that are 90-degrees off or just 2-degrees and don't look right. Again, trial-and-error works best.

When it looks right is a good time to do an intermediate save. AutoCAD does automatic saves, but you really want to save it when it looks right.

<i>Explanatory Narrative</i>	Please recognize what you just did. You converted a digital camera snapshot into a poster or did something like microphotography that used to cost \$10,000.
----------------------------------	--

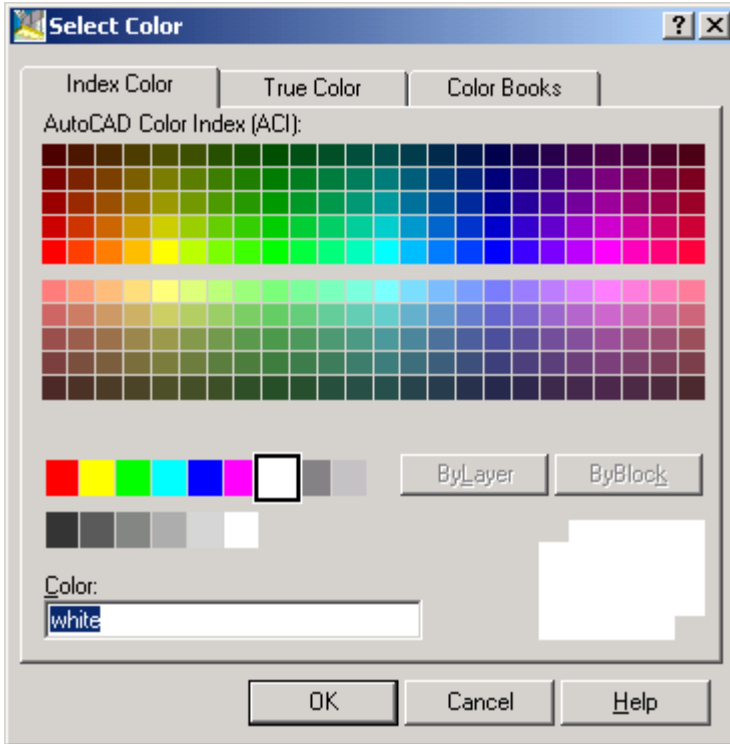
Layer manager is a very powerful tool for complicated drawings. It contributes nothing to simple sketches and can usually be ignored for mark-ups and revisions. However, the concepts are powerful and should be understood, especially for times that AutoCAD seems to be acting strange - it is usually a layer, property or block problem.

You say, "LA<RET>" and layer manager comes up, something like the screenprint below.



This is from a new drawing (blank) in Autodesk Building Systems 2005. Note that Layer 0 is high lighted and the box at the top right says that the current layer is 0. Layer 0 is a special layer for several reasons. It is the default layer when you start a new drawing. It also has the unique characteristic that when you insert a block into a drawing with current layer = 0, then the block keeps its colors and attributes, unchanged. In any other layer, the block takes on the attributes of the layer where it is inserted.

On most systems, Layer 0 is color WHITE (see high light stripe, COLOR column). By default, It prints as a moderate line. Very good for sketches. Some firms redo the defaults and make Layer 0 something very light - not good for sketches. This becomes obvious when you print. I usually fix it by changing the COLOR to YELLOW, which is rarely mucked up. You change a color by clicking on the intersection of the WHITE line and the COLOR column. Choose your desired color from the pop-up reproduced below.



Note that white is the present value, both in the window and the marked box on the simplified palette. You click on yellow on the palette and get that display color and the line width associated with yellow. Note that on my pop-up, something has been deleted on the lower right.

Note especially the 6 grey boxes near the bottom, these are colors 250-255. Usually, but not always, Color 252 is shaded 25%, 253 is 50% and 254 is 75%. Shading “fades out” the line, for backgrounds and details that must be shown for reference but are not part of the direction to the contractor. Works very nicely on sketches, as well.

Basic Draw Commands

In this section we will show how to use line, polyline, circle, polygon, mtext and block. Blocks have very complicated interactions with the layer manager.

LINE is the original line command. You say, “L <RET>” and the machine answers, “LINE Specify first point: “. The command can be LINE, lower case or upper case, or L, lower case or upper case.

At this point, the machine will accept a coordinate location in x,y or x,y,z notation, or a cursor location identified by a left-click on the mouse. If you are going to use SNAP to line things up, it is important to have SNAP turned on, the button at the

bottom depressed. Do not confuse SNAP and OSNAP. SNAP is for grid locations. OSNAP is for connecting to existing objects.

Notice that you can turn on SNAP while you are in the middle of a LINE command. Just a few commands work like that, but it is very nice.

We click on a start point and the machine says, "Specify next point or [Undo]:" "

We click on a point and the machine says, "Specify next point or [Undo]:" " Now, it should be starting to make sense. UNDO for the first point didn't contribute much, but now that we have started a multi-segment line, it is nice to keep the earlier work but change the last point.

We tell the machine, "<RET>". It says, "Command: " back to start a new command or repeat the last command.

I say again, ready to repeat the last command. AutoCAD tries to keep track of your last command so that you can repeat it easily. Instead of a new command, just say, "<RET>".

The machine says, "LINE Specify first point: ", just like when you start the LINE command. You say, <ESC> or <RET> to break out of the memory sequence.

Draw a box. Say, "L <RET>". Click on a start point. Move the cursor to the right and click on a point. Move the cursor down and click on a point. Move the cursor left and try to line up with the previous and first points. Click. (Now you see the value of GRID, SNAP and the large crosshairs on the cursor - easy to line up a good square.) Instead of moving the cursor back to the first point, say, "C <RET>" for CLOSE.

The importance of CLOSE is that it exactly closes the polygon. It doesn't make the sides parallel or the corners 90-degrees, but it does make the start and end exactly the same point. This is important in order to get the HATCH command to work (later).

I believe that LINE in versions before 2000 stopped after the first segment. You had to use the (blank) <RET> to restart the command to keep going. I do not presently have ver 14 available to check this remembrance. The old LINE command is not as good as the POLYLINE command we will look at next, but some of the new commands don't work or don't work right with the POLYLINE command.

POLYLINE, or PL, is the improved version of line. It works the same way, but has many modifiable attributes. Also, when you start and end a polyline, you can define the width without entering the editor.

<i>Explanatory Narrative</i>	<p>“Objects” and “attributes” are terms from the newer programming languages. “Objects” are the pieces you work with. In AutoCAD, a line on the screen is an object, defined by its start location, its end location and a few other things, like color and width. The object is named LINE, with a reference number and the start and end locations. The associated features, like color and width are attributes. AutoCAD is a program that handles lists. The lists are usually lists of objects, like the LINES that make up a square. It doesn’t know anything about the square, but it knows about each LINE. The attributes are additional lists, attached to each object and carried along with it whenever the object is moved, or copied or erased.</p> <p>Why do we care that LINES are objects? Well, AutoCAD acts funny sometimes, but it makes sense when you remember that AutoCAD doesn’t know anything about the graphic image, It only knows about the graphic objects that make up the image. Also, many years ago, skilled AutoCAD operators could view the object lists and manually modify them when the built-in commands weren’t working right.</p> <p>THIS STILL HAPPENS. Sometimes a drawing picks up a “phantom object”. It shows on the screen and prints, but AutoCAD can find it to erase it. It takes a skilled operator to fix it. Ordinary users try to copy as much as they can to a new drawing and start over.</p> <p>Back to the attributes of a LINE and of a POLYLINE. Each has a width. The width of a LINE is defined by the color used and the translation table between color and plotter pen width. You can easily change the color, but only indirectly change the line width and only to previously defined colors/pens.</p> <p>A POLYLINE has a color and an implied line width, but accepts a forced width, up to several inches wide. This is great for quick-and-dirty edits and for flow charts where there is not good reason to fool with the color/pen tables.</p>
------------------------------	--

You say, “PL <RET>”. The machine says, “Specify start point: “. Click on a start point. Move the cursor to the right and click on a point. Move the cursor down and click on a point. Move the cursor left and try to line up with the previous and

first points. Click. (Again, you see the value of GRID, SNAP and the large crosshairs on the cursor - easy to line up a good square.) Instead of moving the cursor back to the first point, say, "C <RET>" for CLOSE.

We should save the edit commands for the next section, but let's at least exercise the line width thing we just talked about. You say, "PE <RET>", for POLYLINE EDIT. The machine says, "PEDIT Select polyline: : You click on the box we just made. The machine says, "Enter an option [Close/Joint/Width/Edit vertex/Fit/Spline/Decurve;Ltype gen/Undo ". You say, "W <RET>".

The machine says, "Specify new width for all segments: ".

<i>Explanatory Narrative</i>	<p>What is a reasonable line width?</p> <p>Most pen widths are around .001-inches. A forced width of .004-in is a nice, wide line. Experiment to see what you like.</p>
------------------------------	---

You say, ".004 <RET>. See if you like the result. "U<RET>" to undo and start over without damage.

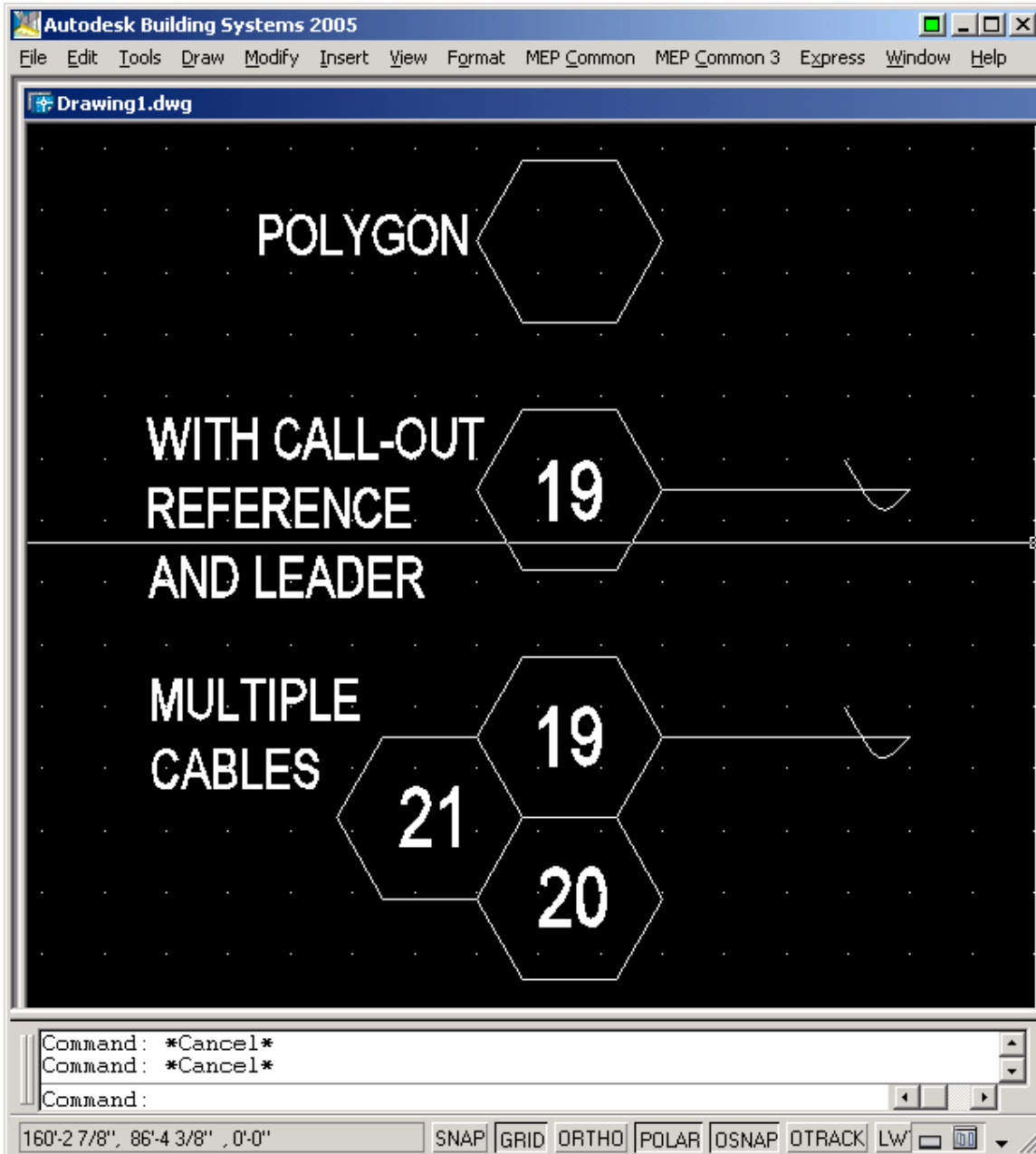
I cannot comprehend how to create circles by eye. I must have SNAP on. I tell the machine, "C<RET>". It says, "CIRCLE Specify center point for circle (or, ...some other stuff). I move the cursor to where I want the circle center and left-click. Because I have POLAR on, my cursor now adds a cross to the cross hairs. As I move the cursor around, the machine faintly draws a circle and calls out the radius and angle to the present location.

Again, I count on snap to keep me honest, so I always go horizontal or vertical. If I can't get a radius I like, I go 45-degrees. This is the first circle of this course.

Our next command is POLYGON. I tell the machine, "POL<RET>", and it answers, "POLYGON Enter number of sides <4>:" That means it really wants to do a square. I use hexagons for cable call-outs, so I will say, "6<RET>". The machine says "Specify center of polygon or [Edge]: ". I say, "<RET>". It says, "Enter and option [Inscribed in circle / Circumscribed about circle] <I>: ". I say, "<RET>". It draws the associated polygon for each location as I cursor about the screen. When I like a trial polygon, laying on a flat side, I left-click.

Because I had SNAP on when I created the polygon, the vertex on the right comes out on a snap point. For my example, the top and bottom flat sides do not line up with the grid, but they are centered horizontally on the grid. This is what I wanted. I will use a polyline as a leader from the call-out reference to the cable

being identified. The hex is especially nice because it lets me attractively call out many cables in a single conduit. See the example below.



Now that I am communicating with you via graphic images, I need to enter text - for the call-out references and for the labeling of the objects. I used MTEXT. The older TEXT and DTEXT still exist, but have nothing going for them. I say, "MTEXT<RET>", and the machine says, "yada-yada-yada, Specify First Corner: ". I mouse the cursor up to the upper left hand corner of where I want my text and left click. The machine says, "Specify opposite corner or [yada-yada-yada]: ". I mouse the cursor over to make a box for the text and left click. The machine

says nothing but opens a text box and a text toolbar. On my machine, it wants to use RomanS font. But, I want to Use ARIAL, so I go to that window and select ARIAL. It says it is going to be 3/16-in high. I know that is wrong, but the latest version of AutoCAD lets the installer limit the text sizes available sizes. I don't even fight it any more. I cursor to the enter-text box and type, "MULTIPLE CABLES". I do not hit <RET> because it will start a new line of text. Instead, I cursor up to the toolbar and left-click on OK.

Because I know what is going on, I don't expect to see my text. I look closely and see a point at the upper left corner of the box I created. This is electrical text (3/16-in) on a civil drawing (10-ft). To make it work, I say, "SCALE:<RET>", and the machine answers, "Select objects: ". I mouse the cursor up to the new point and left click. The machine says, "1 found, Select objects: ". I say, "<RET>".

I mouse the cursor over the point and left-click. The machine says, "Specify scale factor...: ". I say 100.

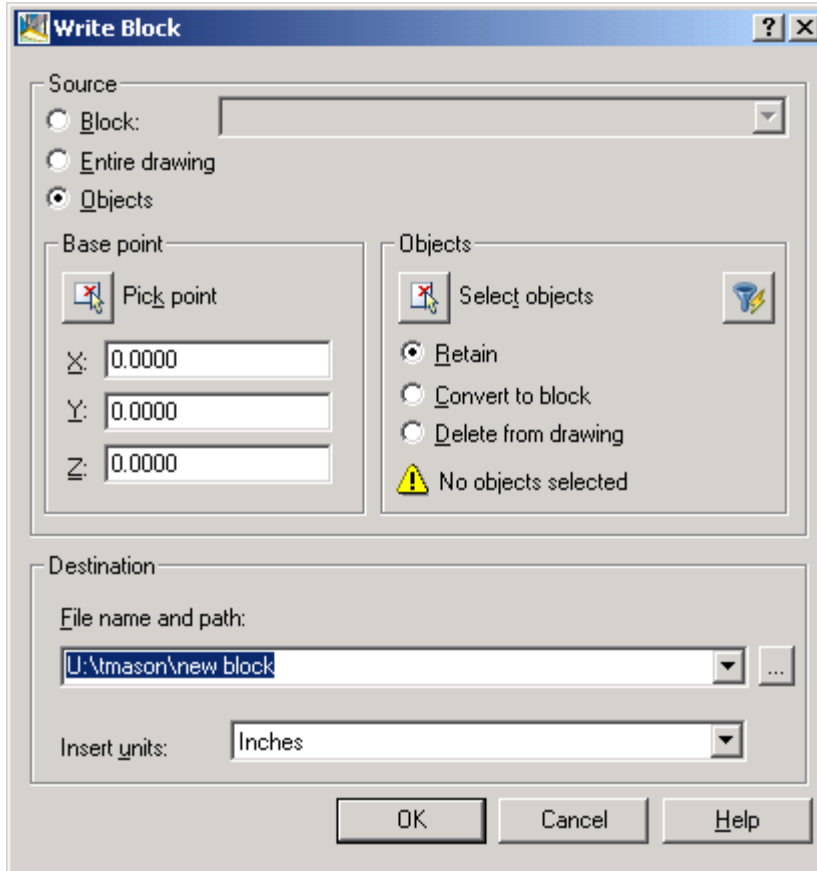
<i>Explanatory Narrative</i>	The reason I say "100" is that it is a continuing problem to change between paper space at 1/8' = 1'-0" and model space at 1:1. The multiplier is 8x12, or 96, about 100. No one has ever noticed the 4% error in scaling by 100.
------------------------------	---

The point, and apparently the text, disappeared. If I pan around, I find my text, just beyond the window I was using. It is still not large enough, so I scale again, by 10. This time, a little too big, so I scale by .5. Yes! that's what I wanted.

The point here is that MTEXT (multi-line text) works very well. The AutoCAD people have inserted some problems, but there are simple work-arounds. By the way, your author is not the only drafter who muddles his way through to get a presentable drawing. Almost 50% of the drawings I revise have very peculiar embedded features - things the last drafter did to get it to work.

An AutoCAD block is a grouping of graphic objects that can be handled as a single object. The basic concept is extremely powerful and it has been expanded with more features with each revision. The classic example is the conference table with eight chairs. You work real hard to make a good chair. At this point you can copy it seven times and be done. Or, you can recognize that it would be nice to use this good chair on other projects and there is a hazard associated with moving so many tiny curved lines and copying them repeatedly.

ACTION ITEM: Draw a good chair, to scale 1:1 (on the background you will be using). Tell the machine, "W<RET>". The machine delivers a pop up WRITE BLOCK, as illustrated.

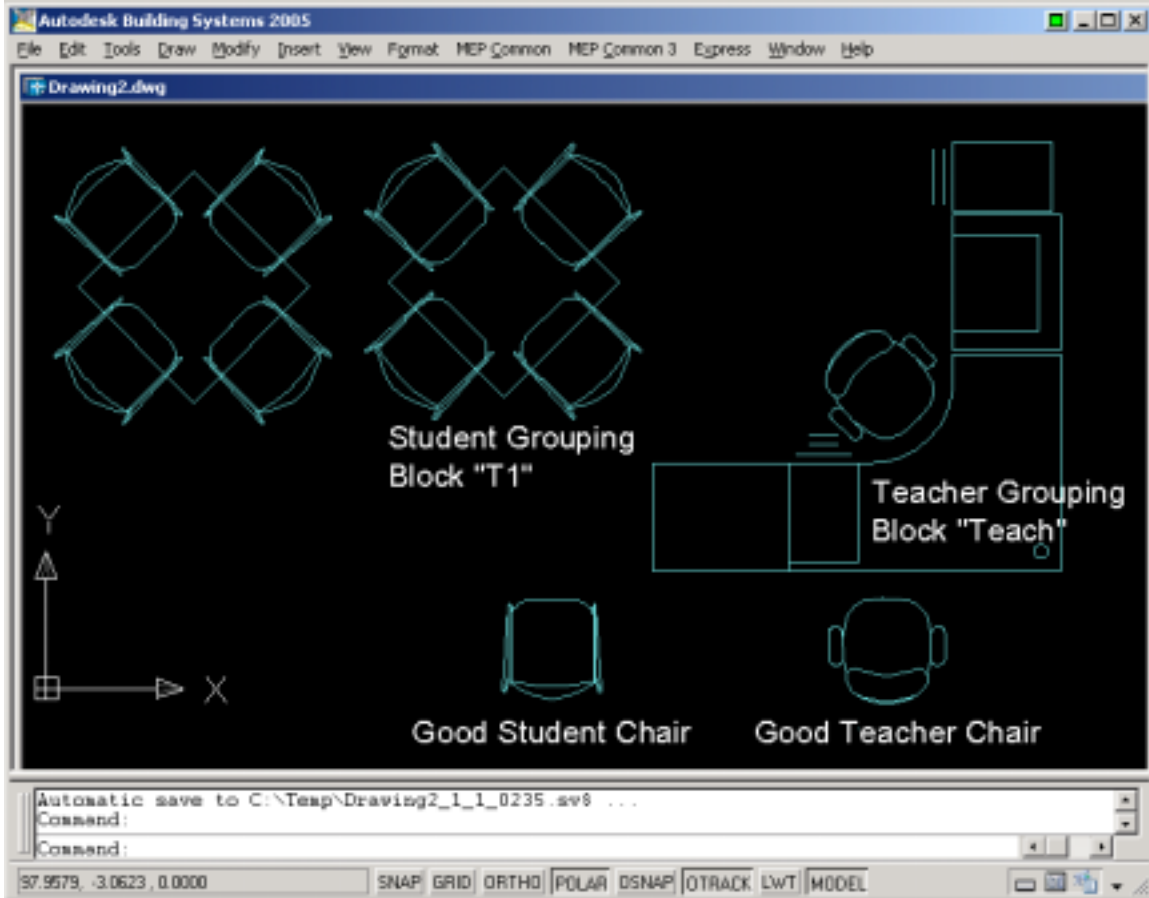


Leave the selection for OBJECTS (because they are individual lines). Mouse the cursor to the SELECT OBJECTS icon and click it. The pop-up goes away. Mouse the cursor to the lower right corner of the space containing the things you want to make a block. Left Click. Mouse the cursor to the upper left corner of the objects to become a block. Left click.

The pop-up returns. Mouse the cursor to the BASE POINT icon and click it. The pop-up goes away. Mouse the cursor to the lower left corner of the space containing the things. Left click.

The pop-up returns. Fill in the new block name and path. Most projects want you to keep all the new blocks in the main project drawing directory. Some projects have special instructions. Always keep a copy for yourself in your private directory or carry-along memory device. (Pod-Slurping.)

Regarding the block name. There are rules which make life better. Electrical block names should start with "E-", as "E-QUAD-RECEPT". Names should mean something so that you can find them in three months. The examples shown below are from a current job and violate the rules. The right hand block should be "A-TEACH-DESK". This isn't as serious as it sounds, though, because AutoCAD shows you a thumbnail preview when you pick a block to insert.



This version of AutoCAD lets you choose to keep the objects on the original drawing (retain).

To insert the new block into the drawing, tell the machine, "I<RET>". The machine gives you an insert pop-up. The first time you insert an external block, you have to find it, using the BROWSE. After it is added to the drawing, you can scroll down the text box to find it. Sometimes you need to change a block. You define the new version exactly like the first. Save it with the same name. Use the insert again, but use the browse to get the external version. The machine will ask you if you want to redefine the block. Say, "Y<RET>", and it will redefine ALL INSTANCES of the block on the drawing.

On the INSERT pop-up, you have a number of choices. The key choice is insertion point. With SPECIFY ON SCREEN checked, you mouse the cursor to where you want the block and click. With SPECIFY ON SCREEN not-checked, you choose the insertion point, usually 0,0, the origin. For instance, I often WRITE BLOCK the HVAC reheat terminals from the HVAC drawing. I insert them onto the electric power drawing so that I can run fan power or electric heat power to them. I WRITE BLOCK from 0,0 and INSERT to 0,0. 99% of the time this works. 1% of the time the HVAC guy has moved the building background from its original reference point.

By the way, the block moves around as a group, so if you can get one element right, everything is right. I open the HVAC drawing on the right side of my screen and the electric power drawing on the left and move the terminal block until it matches. Usually, a terminal near a door jamb is easy to position correctly.

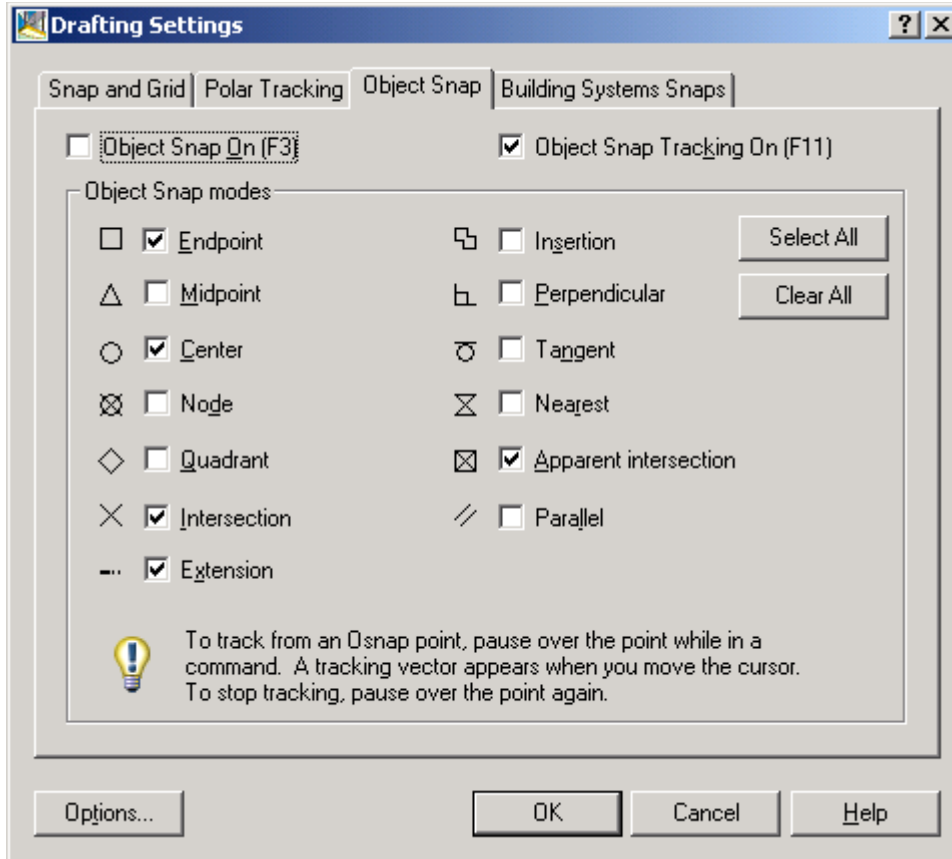
The ability to redefine and replace blocks is a big advantage. The other big advantage is that you can maintain a library or buy a library of standard blocks.

Until recently the clipboard didn't work well on AutoCAD and blocks solved all known problems. As AutoCAD improved, drafters noticed that ^C (cut) and ^V (paste) are much easier and carry along attributes better than a BLOCK. The block is very sensitive to layers. You should always insert a block into Layer 0. Cut and paste take along the present layer and create it on the destination drawing. You do not get the grouping of a block, though.

Basic Edit Commands

In this section, we will show how to use OSNAP, move, copy, stretch, erase, trim, ddedit, ddatte, CHPROP and MATCHPROP.

In AutoCAD we work with single and multiple objects. Use of the SNAP tab at the bottom of the workspace was discussed earlier - to simplify alignment. OSNAP is a similar idea but much more sophisticated. The idea is to use the geometric properties of the objects. To get an idea of what is available, right-click on the OSNAP tab at the bottom. You should get a pop-up something like the following:



This is the default setup on the machine I am using. I don't get into the setup unless it is not working (this sometimes happens when I sit at another machine). The ENDPOINT and INTERSECTION are the only OSNAPS I regularly use. The multiple cable callout from the PL drawing section was done with OSNAP on. A COPY was performed using the corner of the hex. It was dropped on a different corner, and, again, on a different corner. Then OSNAP was turned off.

Distinguish, please, between PAN and MOVE. Pan is very similar to use of the scroll bars. You tell the machine, "P<RET>". The cursor changes to a hand. You click and drag to look at a different part of the drawing. Hit <RET> to get back the command prompt. PAN doesn't change anything, just how you are looking at it.

MOVE changes the drawing. You tell the machine, "M<RET>". It answers, "Select objects: ". You have a choice of mousing the cursor from lower-left to upper-right or upper-right to lower-left. Lower-right to upper-left is called CROSS and picks up every object touched or enclosed by the box. Upper-left to lower-right is called WINDOW and picks up only the objects completely within the window. CROSS works best of drawings with a lot of space. WINDOW works best with busy drawings. Of course, you can move back any extra objects, or say "U<RET>", to UNDO and try again.

You select the objects and say, "<RET>". The machine says, "Specify base point...". Choose any convenient point, or a key geometric point if you wish to define the destination location using OSNAP. Drag the object to the new location and left-click. All done. You are back to the command prompt.

COPY works exactly like MOVE, except that the original objects remain intact, at the original location. Note that you cannot move just part of a block. You must first EXPLODE the block into its constituent objects. You tell the machine, "X<RET>". The machine says, "Select objects: ". You click on a few. Note how much goes shaded; this identifies the extent of the block. You say, "<RET>", and it is done.

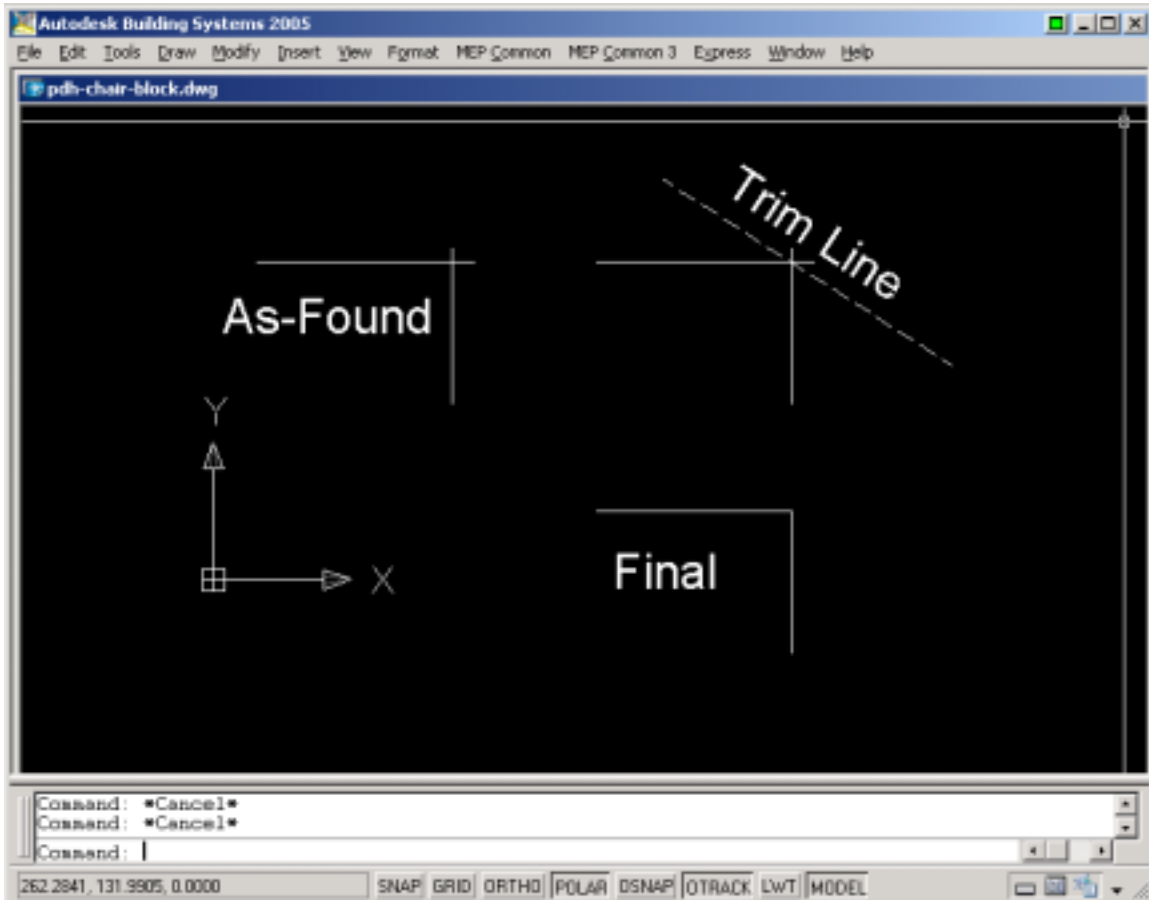
STRETCH is like SCALE, but in only one direction. I use it all the time to increase the size of a box around some text. For example 9 power panels have short tag numbers, but one a much larger tag. You tell the machine, "STRETCH<RET>". The machine asks you to select object by crossing-window (lower-right to upper-left). Left click at the lower-left corner; mouse the cursor to the upper-left. Left-click. Notice the objects which go shaded. You say, "<RET>". The machine asks for a base point. This should be in the cutting line that you hop to stretch. Drag, then left click. "U<RET>" if you aren't satisfied with the result.

ERASE is a simple, basic command that just works - most of the time. Three special cases are noted - blocks, XREF's and phantom objects. There is nothing wrong with the way erase works on a block. It erases the block. However, you may not realize the extents of the block and be surprised by how much gets erased. This is avoided by exploding the block and erasing particular graphic objects that make up the block. Be warned that colors and line weights often change when you explode a block. These can be forced back to the earlier values, using CHPROP or MATCHPROP.

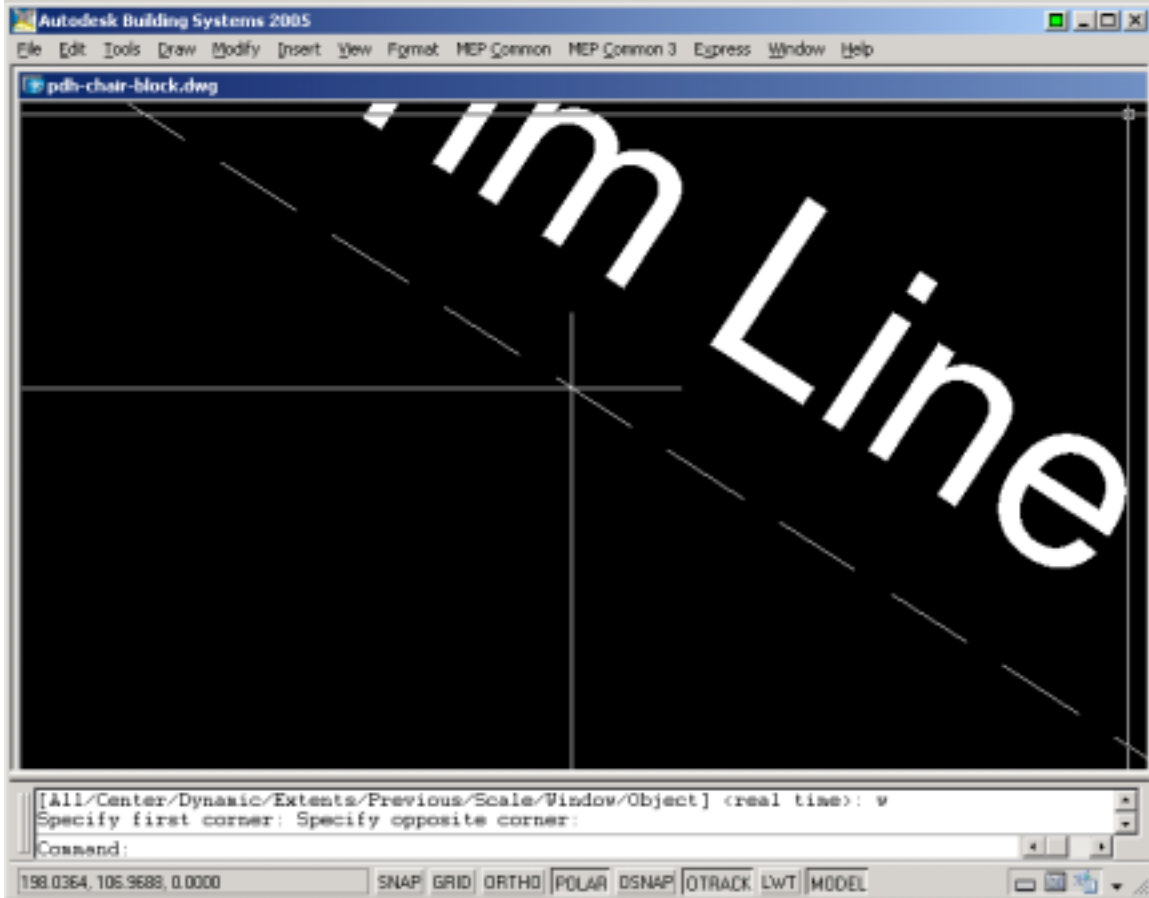
ERASE works correctly on XREF's. It erases the entire graphic object. This forces us to discuss XREF's, however. An XREF is a copy of a complete external reference drawing which is brought into the current drawing. All of the colors on the original drawing appear on the current drawing Layer Manager and can be adjusted, from NO-SHOW, to Color 254 (heavily shaded) to Color 2 (for prominence). XREF's have a great many special features, especially the fact that when the original drawing is revised, the XREF in the current drawing shows the revised form. Other than that, it is almost identical to the background use of BLOCKS which had been common. XREF's cannot be modified without going to the original drawing. They can be introduced to the current drawing by use of IMAGEATTACH (just like blocks). Also, they can be moved, copied or erased, just like blocks.

Phantom objects were discussed in the explanatory narrative on objects and attributes, following introduction of the polyline command. ERASE does not work on them. Regular, intended objects can be moved or copied to a new drawing to get rid of phantom objects.

TRIM is a wonderful command in at least three ways - you cut off unwanted portions of an object, you clean up an intersection, and, you create the graphic effect of one line passing over another line. Below is illustrated the clean up and intersection procedure. The goal is a clean corner at the intersection.

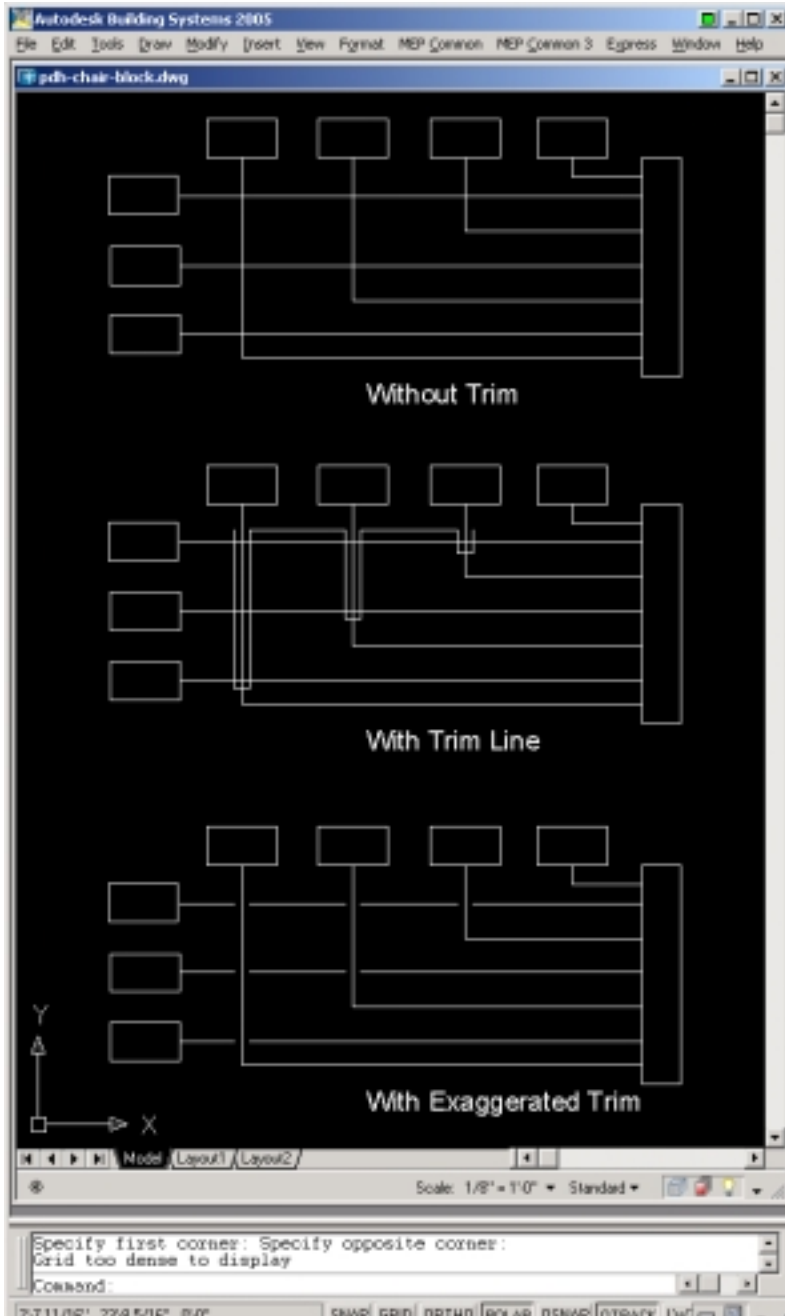


First step is to draw a trim line. (I zoomed in at this point .)



Layer, color and line weight are unimportant. Then you tell the machine, "TRIM<RET>". It replies, "Select cutting edges: ". You click on the trim line and say, "<RET>". It says, "Select object to trim: ". You click on the objects to be trimmed off. If you don't like the result, say "U<RET>", and start over.

The trim for crossing lines example follows.



DDEDIT is the command to edit text. You tell the machine, "DDEDIT<RET>". It says, "Select an annotation object: ". You click on the text you want to change. Most of the time, the text window and toolbar come up. You retype, backspace, cut-and-paste within the text window or change the formatting, using the toolbar. This works more often on the new versions of AutoCAD. On the older versions, embedded text was not accessible through DDEDIT. You had to use DDATTE. Of course, you could also explode the block, then edit the text. (This was a good way of discovering blocks.)

DDEDIT does not work on XREF's. You hope that the original drawing for the external reference has text on a separate layer and you can turn it off. Create new text for what you need. If not, you do bad things, like mask off the old text with a black block or hatch marks. Then create the new text.

DDATTE is the command for changing text embedded in blocks. The person who creates the block identifies modifiable text and fills out a pop-up for tag and initial value. DDATTE brings up that pop-up so you can modify the current value. If the text you want to change is in the block as un-modifiable, then you have to explode the block to get at it. Really strange things happen when you explode a complex block. Always recoverable via "U<RET>".

CHPROP and MATCHPROP let you force properties on existing object. I frequently change color and line type. There are many more properties, but they don't have much effect on how the drawing plots.

For example, you might be writing a course on minimal AutoCAD. You want to demonstrate the TRIM command. You create an intersection and a trim line, but it all blurs together. You want to put emphasis on the trim line. So, you tell the machine, "CHPROP<RET>" and it answers, "Select objects: ". You click on the line you want to change. It goes gray. You tell the machine, "<RET>". The machine says, "Enter property to change [Color/Layer/LType....]: ". You say, "LT<RET>". It says, "Enter new line type name <CONTINUOUS>: ". You say, "DASHED<RET>".

Unfortunately, on a new drawing, the first attempt at a dashed line usually doesn't quite work. Because AutoCAD has no inherent scaling, it uses an arbitrary scaling and lets the drafter change it to suite. Your line type scale is at default of 1.0. Try 10 and .1 to see which way makes it better. You say, "LTSCALE<RET>". The machine answers, "Enter new line type scale factor <1.0000>: ". You say, "10<RET>", and see what it looks like. I liked the result and that is what you have on the illustration above. It is not necessary to "U<RET>", just enter a new LTSCALE.

CHPROP works when you know what you want. MATCHPROP is for when you don't care what it is, just so long as it matches something else.

You tell the machine, "MATCHPROP<RET>". It answers, "Select source object :", the one you want to emulate. You click on the one that already looks right. Cursor changes to a paintbrush and the machine says, "Select destination object(s) :". You click on the graphic object you want to fix and say, "<RET>".

Of course, MATCHPROP doesn't work with blocks until you explode them and doesn't work with XREF's.

Save and E-Mail Commands

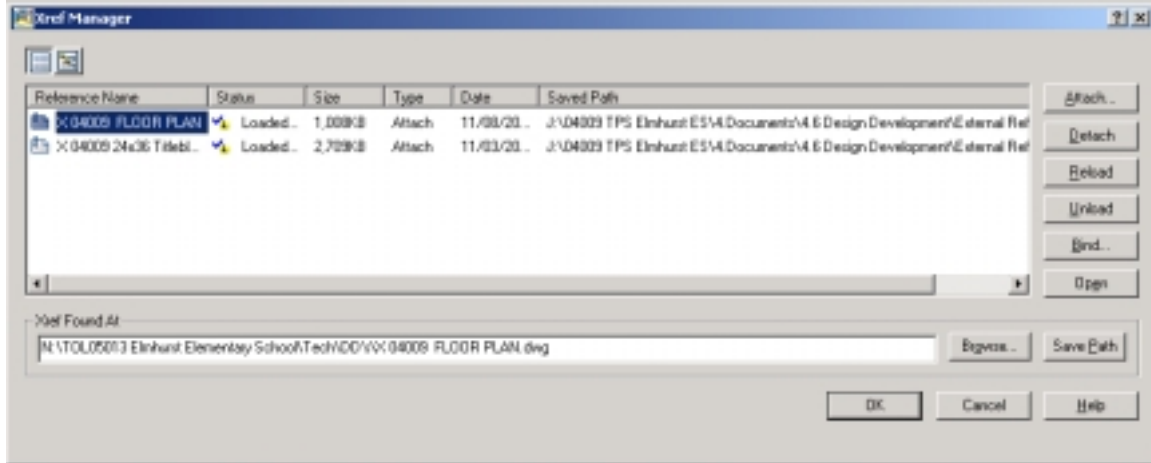
In this section, we will show how to use save, saveas, xref, jpg and send commands.

SAVE is a quick command to save recent work by replacing the stored file of the current drawing with the work now on the screen. It usually does not prompt you for file name or path. This is excellent for production work, but not a good idea for mark-ups and incidental revision, as just before a shipment.

SAVEAS always prompts you for file name, path and lets you change the AutoCAD version. If you are making a markup to show the designer some things you would like to talk about, save it as *FILENAME-MU*.dwg. He finds it by the name he knows and recognizes that it is a markup. I often put my initials in the new name to tell him whose markup it is. Lately, I have been carrying around a thumb drive. I might save the markup to my thumb drive if I am visiting another office or field construction office.

There isn't much change between AutoCAD 2000, 2002, 2003, 2004, 2005 and 2006. Except, the earlier versions won't open ver 2005. So, if you are working remotely with someone on an earlier version, save to ver 2000. There are warnings about this, but no one I know has been able to detect any losses from translating to ver 2000 and back.

XREF's have been discussed in the IMAGEATTACH, layer manager and editing sections. It is important to mention them here again because when you send a drawing that includes an XREF, you usually do not send the XREF. Almost all the time, the XREF is left "loose" from the drawing so it can be updated separately. Send both the drawing and the XREF. Find the XREF by saying, "XREF<RET>". An XREF Manager pop-up is displayed. Warning: there is something hinky about the "Saved Path". Do not trust it. Instead, highlight the XREF in question and study the Xref Found At text box at the bottom, see sample, below.



The exception is when the XREF is BOUND to the drawing. This is sometimes done at the end of the project so that the individual drawing is complete without another drawing. All value of the external reference is lost and the drawing size balloons by several megabytes.

Even the newest AutoCAD is not very friendly to electronic interchange. Out-of-the box, there is a poor JPG plot utility and no PDF plot utility. Very good third party utilities are available and installed by most serious CADD firms. The third party firms are able to convert to high-resolution without huge file sizes. A good scanner does the same thing without noticeable degradation.

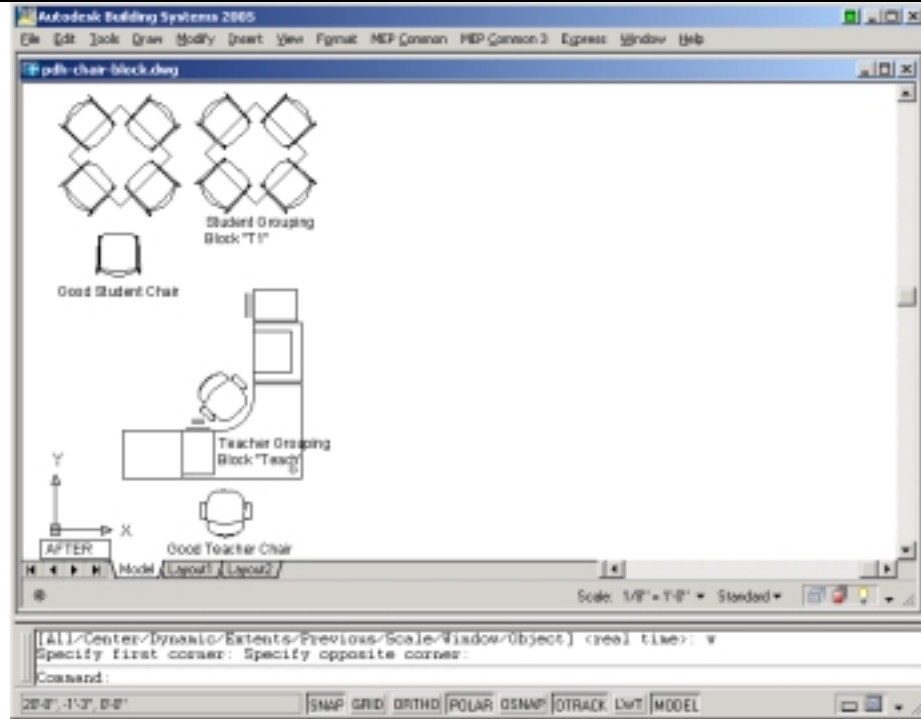
The SEND command transmits the current drawing (no XREF's) via the e-mail system set up on your computer. You find it at menu FILE\send... The good news is that it works very well and is easy. When someone is hounding you for results, you can get them out without interrupting your work flow. The bad news is that it only works with people who are already working on the project. It does not transmit associated external reference drawings, so backgrounds don't show up unless they are on the destination machine. Special typefaces (common for title blocks) are not sent, so the screen on the other end doesn't match your screen. The printer control file (now called .pc3) is not sent, so it won't plot the same on the other end unless the .pc3 already exists there. Also, the drawing file is sent in the version of AutoCAD you are using. If the recipient is not as current as you, he can't open the drawing.

If you want to send a check print to someone, think carefully about plotting 8-1/2x11 and scanning it to pdf. (11x17 works superbly, but 11x17 scanners are rare.). The result is readable, printable, can be annotated and looks exactly like yours looks.

Clipboard Commands

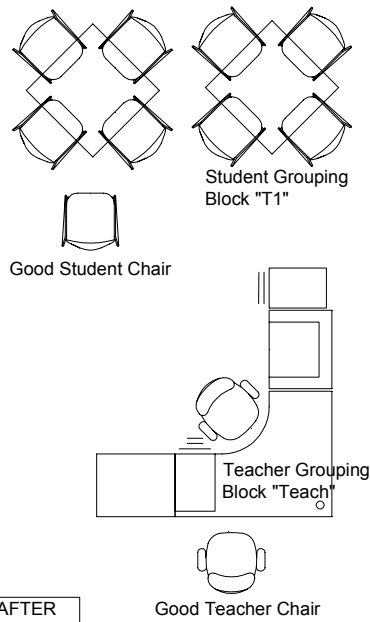
In this section, we will show how to use ^C (control-C, cut) and ^V (control-V, paste) to place text or image on the clipboard and to insert it into a drawing. We will again discuss the fact that the layer manager is NOT affected by clipboard tools.

<i>Explanatory Narrative</i>	<p>In this course, I have used <ALT><PRINT SCREEN> to capture the AutoCAD screen and pop-ups. I used ^V (paste, control-V) in Microsoft WORD to place them in the text. This is appropriate for a course in AutoCAD, but wrong for a course on Electrical Specifications or Fire Alarm Design.</p> <p>For those courses, I prepare sketches, and copy portions of construction drawings using ^C (cut, control C) to capture portions of the workspace. I used ^V (paste, control-V) in Microsoft WORD to place them in the text. Pale blue sketch on deep black background isn't very readable on the screen or on paper. If you print out the text, you use a lot of toner.</p> <p>Therefore, I change the color of the graphic objects and background before I do the cut-and-paste.</p> <p>I change the objects to black by telling the machine, "CHPROP<RET>" and mousing the cursor from lower-right to upper-left, across the items of interest. I tell the machine I want to change the color to be WHITE. It confirms the changed color.</p> <p>[I just did this on the chairs-and-tables example and it didn't work on the Student Grouping Block "T1". I must explode it to get control of the objects' color. X<RET>, click on the group, CHPROP, select all of the objects that made up the block, <RET>, C, WHITE <RET>. Now they all appear white.]</p> <p>I change the background by going to menu TOOLS \ OPTIONS \ DISPLAY \ COLORS and changing model space to WHITE. APPLY & CLOSE. OK.</p> <p>The AutoCAD screen now looks like below.</p>
------------------------------	---



(Most people don't like working with these colors - but some do).

The cut-and-paste result is as below.



Of course, the graphic can be stretched or shrunk within Microsoft WORD.

When you copy within an AutoCAD drawing or to a different drawing, do not change the colors of the objects or workspace. Use ^C (cut, control C) to capture portions of the workspace. Move to the approximate location desired for the copy and used ^V (paste, control-V) place them.

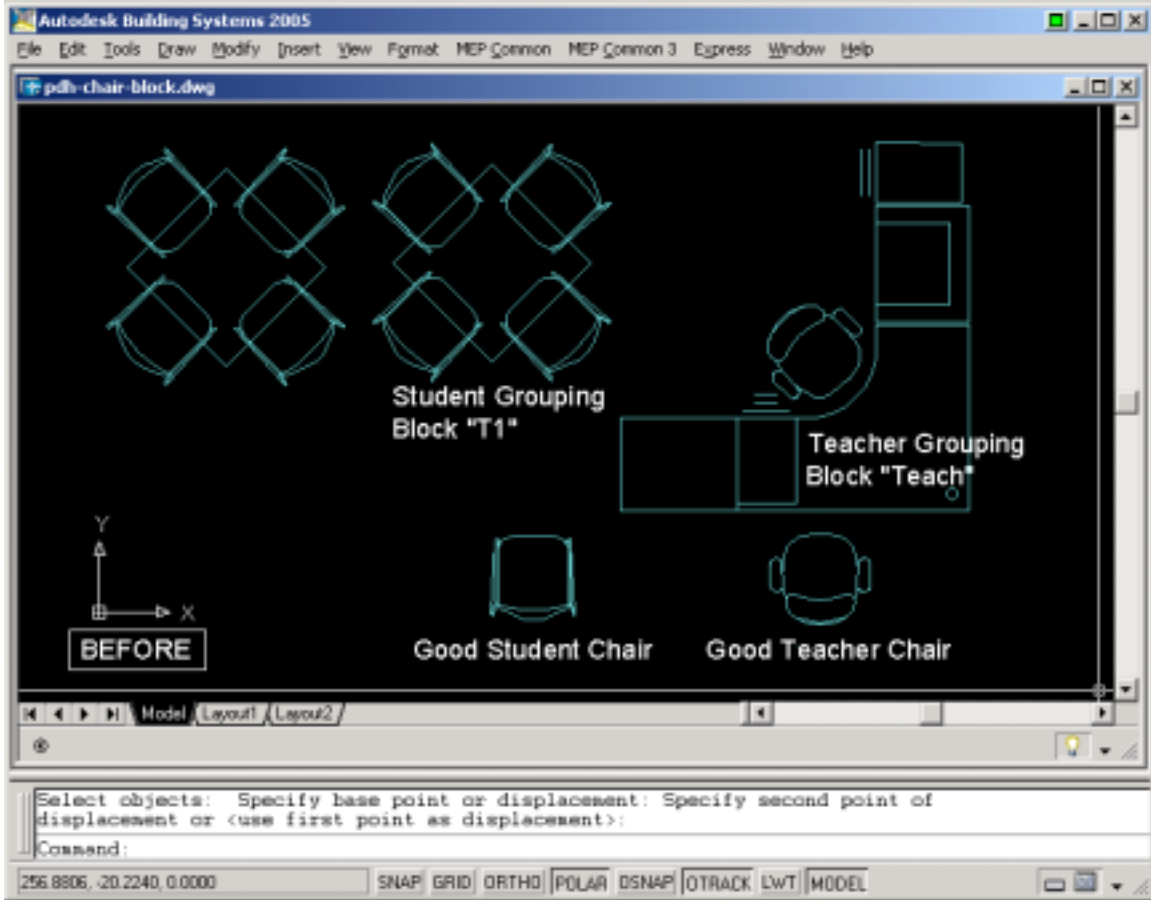
No attributes are changed. The only problem is that alignment is not precise. SNAP doesn't work on cut-and-paste and the location of the insertion point is not quite predictable. This method works well on updating all the title blocks on a project for a new issue.

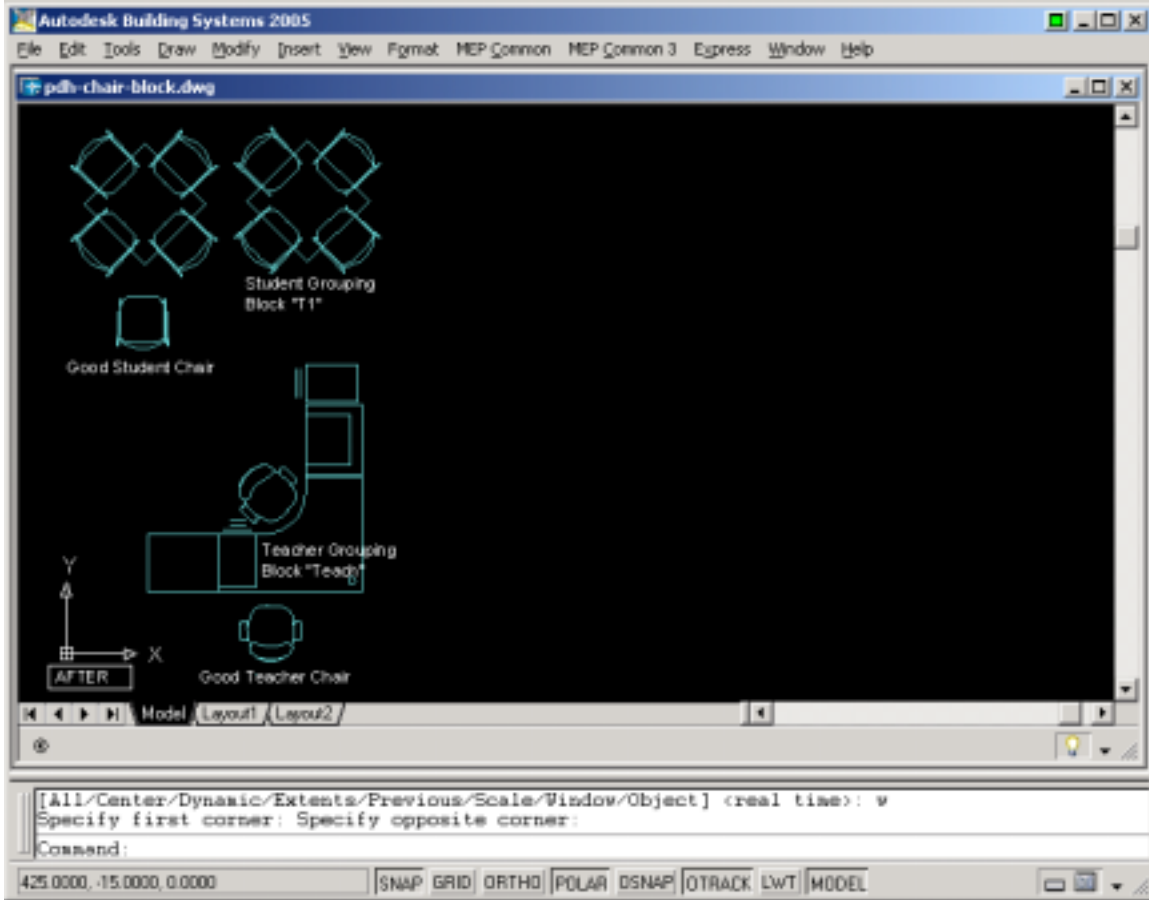
Plot Commands

Normally, the plotted image is the goal of the entire effort. In this section, we will study the plot screen closely to understand the plotter control file, paper selection, centering, plot ratios and line weight adjustments.

Would your drawing benefit for formatting before plotting? If we use the chairs and tables drawing from the block example, we note that the aspect ratio is short and wide. This does not match 8-1/2x11 paper in portrait orientation and is too wide to effectively use 8-1/2x11 in landscape orientation. I laid it out this way because formatting for this course has trouble with page breaks. If I use short, wide graphics, it minimizes the wasted white space at the bottom of a sheet.

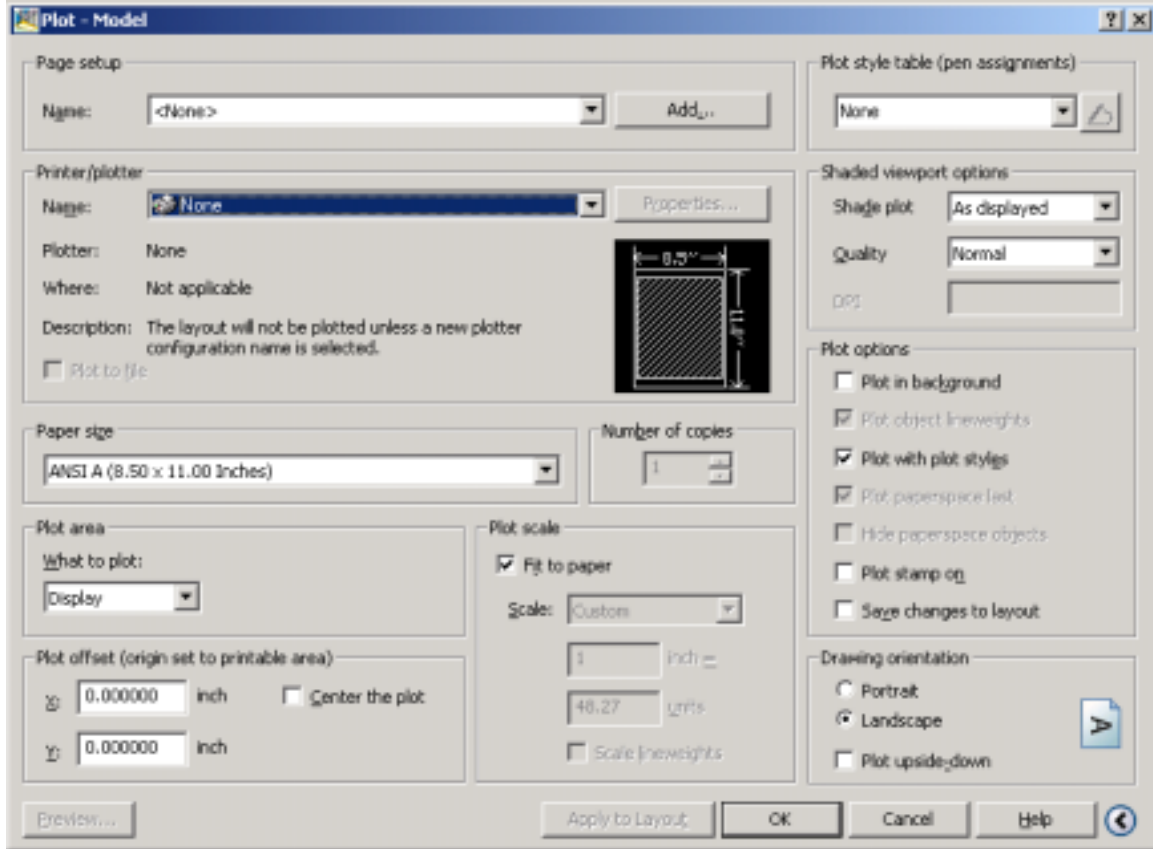
I will move the parts around a little to fit better on an 8-1/2x11 in portrait orientation.





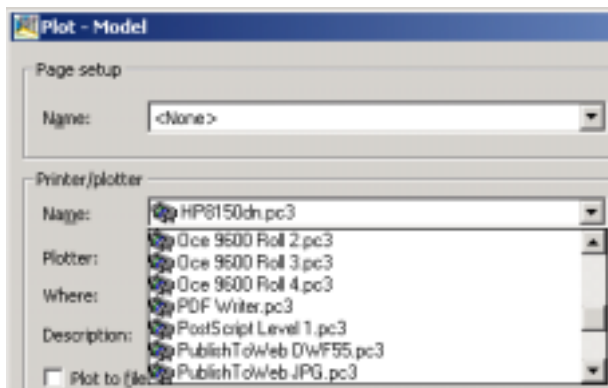
We will see how well this worked when we look at the print preview in a moment. Note that I had to zoom out (Z<RET> .5x<RET>) to get the new arrangement on the workspace.

You tell the machine, "PLOT<RET>". It gives you a pop-up plot control screen. The default I get is shown below.



We will discuss only the critical choices, but if what comes out the printer doesn't look good, when the design screen looks good and the plot review looks good, there is probably a problem in the plot control setup.

The plot control pop-up says that no plotter is selected. You must select a plotter or printer. On the system I am now using, there are about 20 plotters and printers available. See the printer/plotter pull-down below.



HP8150dn.pc3 is the plot control file for the default printer for this pc. It happens to be a high-speed production printer and very rarely produces bad plots. This is a smart printer. The manufacturer understands very well what a good looking

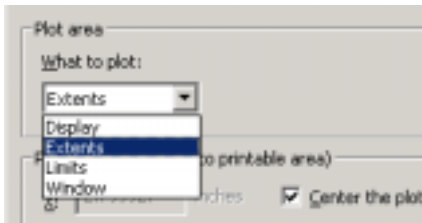
print looks like and frequently corrects bad instructions into good plots. The printer understands margins and necessary white space at the margins to print the whole drawing. This is the printer I use 95% of the time. In your location, there is almost always a system default printer connected to a pc. If it works on Microsoft WORD, it should be available on the AutoCAD plot control pop-up.

The system I am using has a high-speed laser plotter. It prints good plots only after you have run several sample plots on it and adjusted things. It plots exactly what it gets, has a tendency to trim off borders and doesn't understand screening (lightening backgrounds). The media is expensive, numbers like \$1-5/sq-ft are reasonable. (Check the prices at Kinko's.) On this plotter the different rolls available have bond paper, narrow bond paper, vellum and mylar.

We have a third-party pdf writer which works well. DWF is a format that AutoCAD likes. It requires a (free) AutoCAD viewer. PublishToWeb is a bad jpg converter which comes with AutoCAD.

The default plot setup screen chose letter-sized paper. 11x17 or tabloid is often available and larger sizes are available on pen, electrostatic and laser plotters.

The default plot setup screen wants to plot the display. I always plot EXTENTS and CENTER THE PLOT.



The reason for this is that it is more forgiving. Some of the drafters I work with are not good on inserting the border of the drawing at precisely 0,0. The result is that when you leaf through a drawing set, their sheets are shifted 1/2-in. This doesn't happen with the same drawing if you use EXTENTS and CENTER.

The downside is that some drafters do weird things beyond the borders of the drawing. Using EXTENTS, you find things you wouldn't know about otherwise. I like to clean up the drawing file before I give it to the client, so finding this out is not all bad.

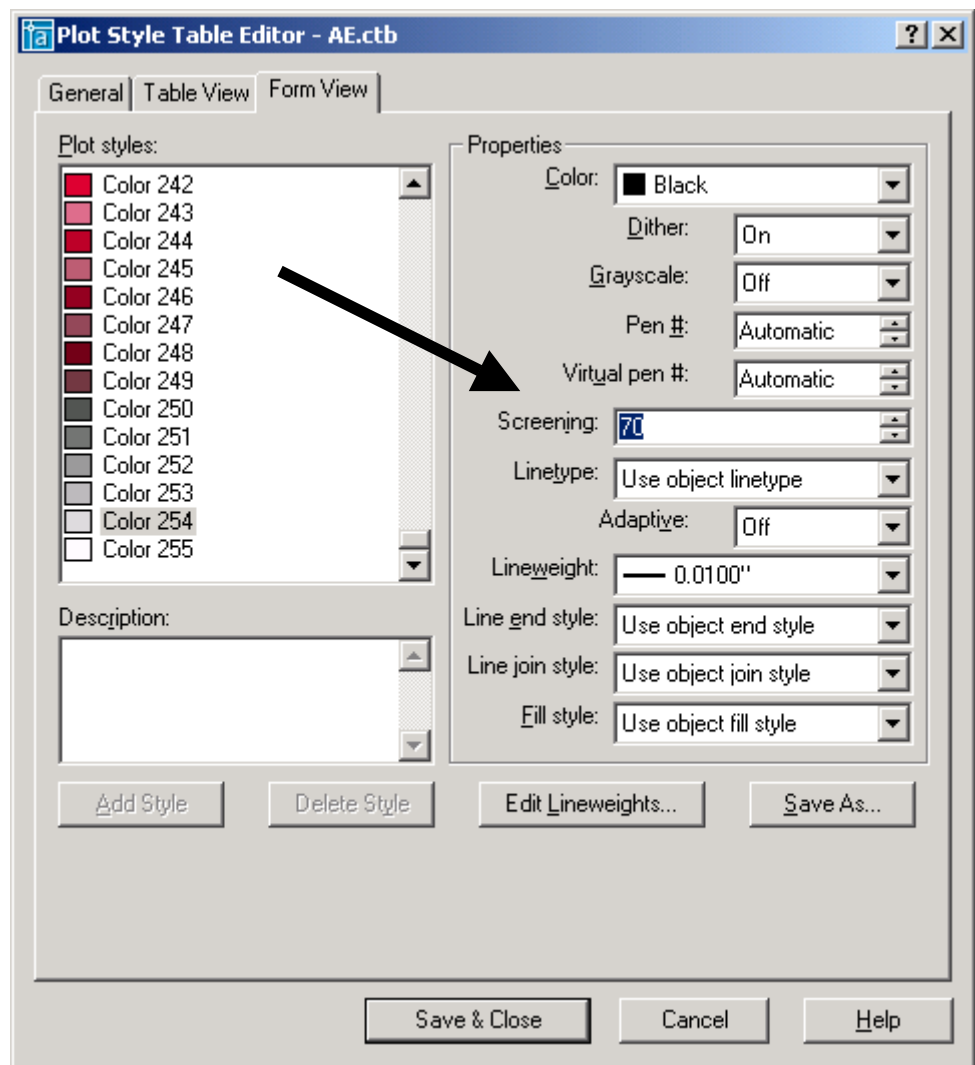
The default printer control screen has no printer control file (Plot style table, here). This is the most dangerous part of plotting, because someone set up each of the color/pen tables, left no documentation and has warned you that you don't dare touch them. There are two choices, use the smart printer or trial-and-error.

Explanatory Narrative

One of the saddest moments of my life was when I plotted a 200-sht construction set on which none of the backgrounds were readable. You could see the electric boxes and lavatories, but not the walls, doors and room names.

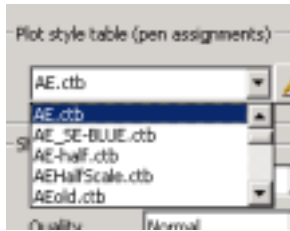
I asked the Drafting Supervisor if this was OK. He said, "Yes". The COO of the firm sealed each sheet. They were sent to a reproduction firm to make copies for bidders. The reproduction house tried to adjust contrast, but there was nothing there to bring up.

You can avoid this by finding out which layer the backgrounds are on, using LIST and LA and editing the plot style table (using the pencil beside the pull-down). Backgrounds are usually on Color 254 and the problem adjustment is the screening per cent. See below.

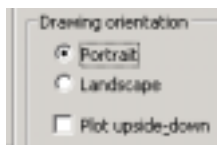


Use test plots to get it right.

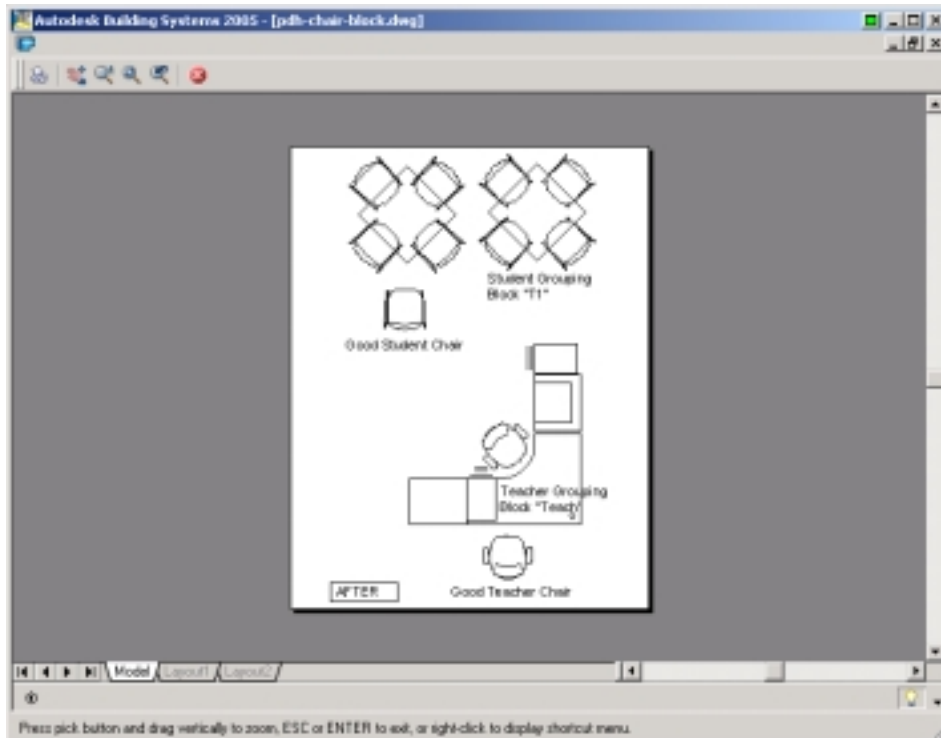
For discussion here, we will choose AE.ctb for the pen style table/ printer control file. Note from the pull-down that there are several versions of AE.ctb, including two versions for half-size plots. Each of them must be different in some, unknown way. AutoCAD ships ACAD.ctb, but it gets modified quickly and has no relation to what you find on your machine.



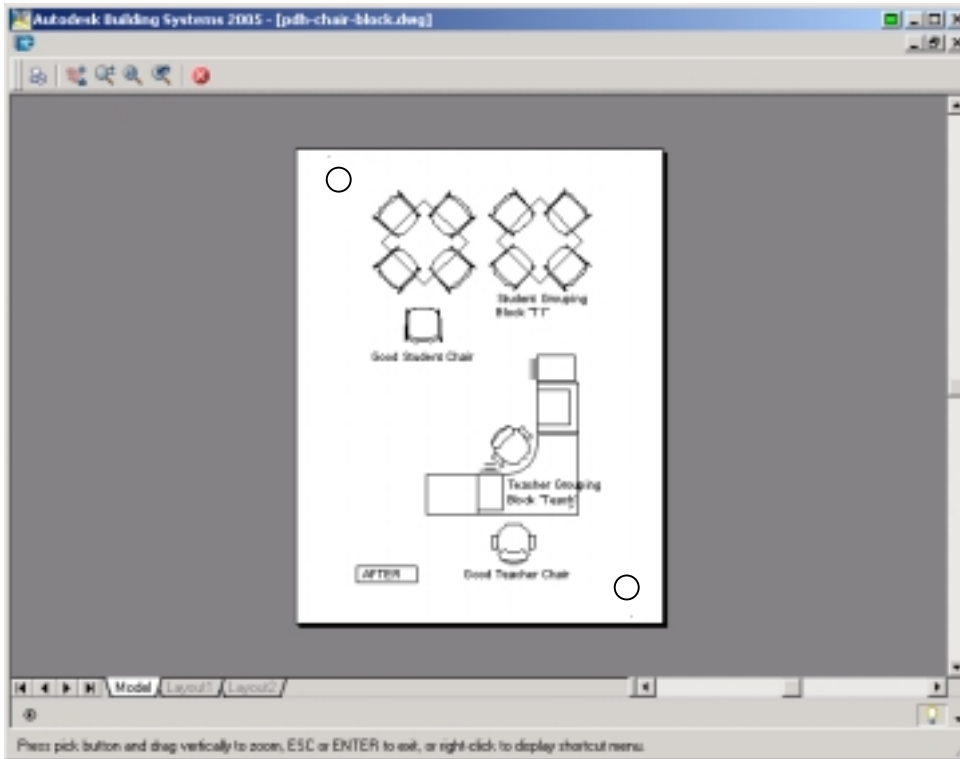
And, change the paper orientation to PORTRAIT.



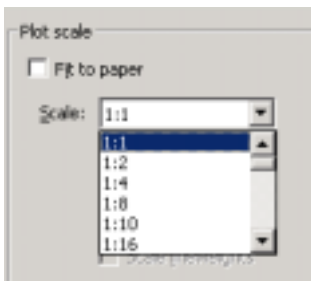
Click the PREVIEW button and the result is similar to below.



If I am plotting on the fast laser, I go back into the drawing and insert points some distance beyond diagonal corners. <POINT><RET> Mouse cursor to desired location and click. see below. This lets the laser plotter chop off the edges while leaving the entire drawing.



The last critical command for plotting is PLOT SCALE. For communicating a specific idea to solve an immediate problem, FIT TO PAPER is good. For documentation that will go into a file for future reference, you need a border and a scale. [You may have to SCALE the drawing objects to match the border. The scale problem is handled by the magic word NTS (not to scale)]. Use a standard 8-1/2x11 border or make your own. Plot using a 1:1 scale.



The other scales are available because 11x17 prints are very, very popular. We call these "half size" and can do the "full size" prints at 22x24 or 24x36. Some

people still use 36x48 “bed sheets”. Other standard scale factors can be used for plotting so that a measuring ruler can take off dimensions.


Fit to Paper, 1:1 and 1:2 are, by far, the most popular.

The right questions to permit setup of a new drawing to match a proposed or existing set are:

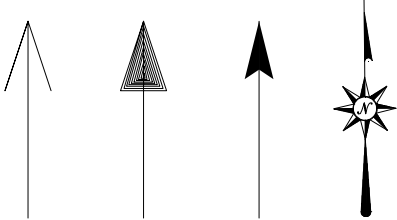
- 1) What layer does general text go on ?
- 2) What is the required height of general text ?
- 3) What color is general text ?
- 4) What font is general text (usually RomanS) ?
- 5) Do you have an XREF or block for the border and title information ?
- 6) What printer control file are you using ?
- 7) What is the final print size ?
- 8) Could you please give me a drawing file that shows correct layout, title block, drawing objects and text ?
- 9) Where do we store the drawing files?

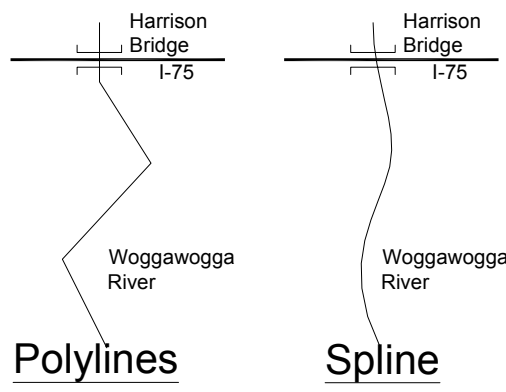
Common Problems and Work-Arounds

Apparent Problem	Underlying Problem	Work Around
You cannot create lines in any color except blue	The last person using drawing opened the Property Manager pop-up and forced all colors	MENU \ PROPERTIES \ COLOR - Change to BYLAYER
You draw a poly line and it comes out very, very wide	The last person using drawing opened the Property Manager pop-up and forced all line widths	MENU \ PROPERTIES \ LINE WIDTH - Change to BYLAYER
		PL <RET> reset initial width to 0,0
You see an item but cannot select it for LIST or ERASE	Object is in MODEL space and you are in PAPER space	Use tab at bottom; change to MODEL space
	Object is in PAPER space and you are in MODEL space	Use tab at bottom; change to PAPER space
Drawing won't open. Error message, "Unsupported version"	Saved in newer version	Go to station with new version installed; save to older version

	Saved in newer version	Ask source to save in older version and e-mail to you.
Background is not visible in drawing	External reference missing	XREF<RET> to view XREF manager; get missing file, now that you know the name and where it was formerly located.
Can't choose a reasonable text height	This is normal. AutoCAD is trying to force standards.	Use the font height permitted, then SCALE it to what you want.
You can't create a line close to horizontal or vertical; it keeps jumping to horizontal or vertical.	POLAR is turned on. This is normal effect.	Turn off POLAR tab at bottom.
Can't figure out how to enter special characters, like center-line,  .	This is normal. AutoCAD doesn't handle special characters well.	Do the "C" in the text string. Do a new text string containing only "L" and move it on top of the "C".
AutoCAD doesn't have any plotters available on the plot setup screen.	No plotters are installed on this machine.	Go to Windows Control Panel Printers and Add a printer.
Background print very light; rest of drawing is OK.	Plotter control file doesn't match plotter characteristics.	Edit plotter control file, using pencil icon beside text window; adjust screening percentage.
Doing repetitive work, as placing receptacles in rooms. Hate COPY/ROTATE repetitions.	There are third-party utilities that do this very nicely, usually free when you buy their library of blocks.	Create a toolkit. Four receptacles at 90-degree orientation. Copy the one you need for each wall. Using sticky COPY, this can be very fast.
Cannot create new text that matches existing.	Too many adjustable parameters available for text.	Copy existing and use DDEDIT.

Exercise #1 - Map

<p><i>Explanatory Narrative</i></p>	<p>This exercise is offered to help you develop confidence in your use of minimal AutoCAD commands and to produce a drawing of immediate value to you.</p> <p>Create a map. We use maps daily and have a good feel for what a map should look like. It should have a NORTH ARROW pointing up (no exceptions). It should have several recognizable reference points, an Interstate highway, a river and bridge or a BP gas station.</p> <p>Everything must be labeled. The map must be large enough and simplified so that it can be used at night under an auto dome light.</p> <p>First, the NORTH ARROW. You know how to draw a line. You know how to enter text. What about the arrowhead. Surprisingly, arrowheads are the subject of great discussion in the drafting community.</p> <p>One fellow I like a lot created the second example. I like the third example. Use one of these or create your own.</p> <div data-bbox="483 1094 878 1312" data-label="Image"></div> <p>How to create an INTERSTATE HIGHWAY? Use a PL and PEDIT to make it wide.</p> <p>How to create a river and bridge? One of the options not used previously is the SPLINE CURVE in PEDIT. Draw a segmented polyline. Exaggerate the size of corners because the spline fit will soften it. Tell the machine, "PEDIT<RET>". Click on the line. Say "S<RET>". Example follows.</p>
-------------------------------------	--

	 <p><u>Polylines</u> <u>Spline</u></p>
	<p>Splined curves are a little difficult. Expect to U<RET> and try again.</p> <p>Do you expect trouble with cross-streets, traffic signals and a symbol for your office? Work it out!</p>

Exercise #2 - Data Table

<i>Explanatory Narrative</i>	<p>This exercise is offered to help you develop confidence in your use of minimal AutoCAD commands and to produce a drawing of immediate value to you.</p> <p>There is a hard way and an easy way to do tables in AutoCAD. The easy way is to type in rows and adjust spacing so it looks right. Draw in lines if you like ruling. All done.</p>
------------------------------	--

Feeder Schedule

#	# of parallel runs	ph wires and neutrals per conduit	phase conductor size	ground size	conduit size
1	1	2	12	12	3/4"
2	1	2	10	10	3/4"
3	1	2	8	10	3/4"
4	1	2	6	10	1"
5	1	2	4	8	1-1/4"

No Ruling

Feeder Schedule

#	# of parallel runs	ph wires and neutrals per conduit	phase conductor size	ground size	conduit size
1	1	2	12	12	3/4"
2	1	2	10	10	3/4"
3	1	2	8	10	3/4"
4	1	2	6	10	1"
5	1	2	4	8	1-1/4"

Ruling

WARNING: This works well with a fixed-pitch font, like RomanS. It works badly with a proportional font, like Arial.

Second warning: AutoCAD prefers unreadable data. It tries to convert 1/8 to 1/8. Say ^Z each time to avoid it.

The hard way uses the same skills. This time, create the text headings first. They will control column width. Each heading should be a separate MTEXT entry.

Next, do the ruling. I drew a box, then a new single horizontal line. I copied the horizontal line. Then, I drew a single vertical line and copied it. (We will adjust box sizes later.)

With the headings in place, you can copy them all to each line. It looks very messy, but gets better as you edit each cell of the table to the numbers instead of text.

Lastly, use STRETCH to widen or squoosh any row or column that needs it.

The hard method is better, for some people, when it comes time to edit individual cell values.

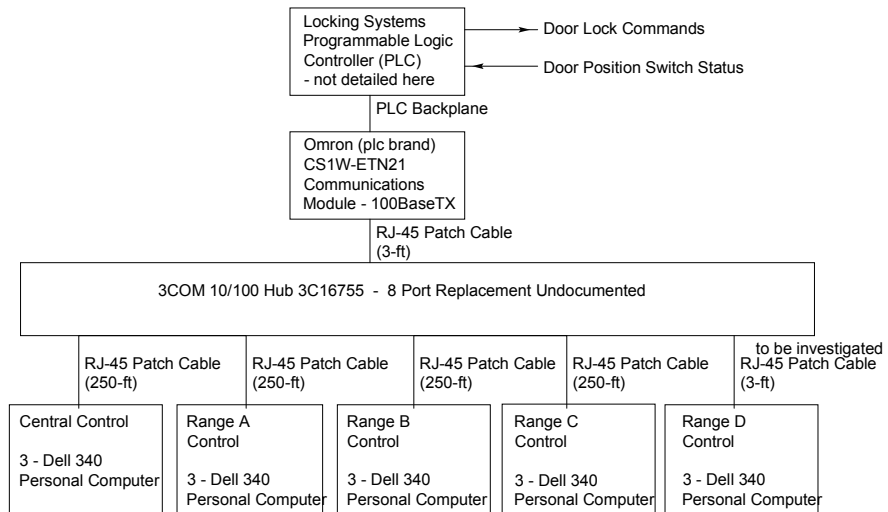
Exercise #3 - Flow Chart / Block Diagram

Explanatory Narrative

This exercise is offered to help you develop confidence in your use of minimal AutoCAD commands and to produce a drawing of immediate value to you.

A flow chart or block diagram is nothing but boxes, lines and text. You can make them more attractive by inserting pictures or the equipment, or building or executive.

Below is an example without pictures.



Big City House of Correction
Locking Systems Data Network

[eof]