DRAW KEYBOARD INPUT

This section describes the details of Accucadd keyboard input. It assumes familiarity with the outline description given under Accucadd: Operation: Keyboard Input.

Entering sizes

Whenever the Status Bar displays a distance or angle as you move the cursor, you can type a value. When you do this, the distance or angle you are varying with the cursor is taken from the value you type, and the function proceeds to its next step, just as if you had positioned the cursor and clicked the button.

There are many functions where this is possible.

To enter a size, simply start typing it in. A window appears to hold the characters you type, and you can correct errors with the **Back Space** or **Del** keys. Press **Enter** to enter the size, or **Esc** to abort it and continue using the Mouse.

Shortcuts

There are several shortcuts to make keyboard input easier:

Suggested input

Some Accucadd functions provide a suggested value for keyboard input. You can press **Enter** to accept this, or edit it with **Del**, **Back Space** or **Home**.

= Key

You can re-enter your last keyboard input by pressing the **=** key. The input window appears with the last input in it. You can then press **Esc** to abort the input, or **Enter** or **F11** to re-use it. You can also discard it with **Home**, alter it with **Back Space** or **Del**, or append to it by typing.

+, -, * and /

You can also change the size displayed on the Status Bar. This is very useful when working with a Snap Grid, as it allows you to draw to points that aren't on the grid without turning the grid off.

Type **+** to add a second number to the size displayed on the Status Bar, or **–** to subtract a second number from it. Use ***** to multiply by a second number, and **/** to divide by the second number.

For example, if the Status Bar shows "100 mm" while you are using Draw: Elements: Line, typing

+27 Enter

would draw a line 100 + 127 or 127 mm long.

Updating (F11 key)

Instead of entering a size to draw something, you can use it to position a start point. To do this, press Function key 11 rather than **Enter** when you have typed a size. The key is usually marked **F11** or **PF11**; we will call it **F11**.

For example, using Draw: Elements: Line you could position the cursor and click to place the start of a line, move the cursor so that the line pointed towards the desired start-point, type the distance of the de-

sired start-point from the current start-point and press **F10**. The current start point is removed and replaced by one at the new position.

Input Formats

The formats for entering numbers from the keyboard are quite simple:

Angles

Accucadd can work with decimal degrees, radians, grads or degrees, minutes and seconds. Set Up: Precision selects the system to be used.

To enter decimal degrees, radians or grads, just enter the number, using a decimal point in the normal way.

To enter angles in degrees, minutes and seconds, separate degrees from minutes with **d** and follow minutes with **‘** and seconds with **“**, just as angles are normally written. When the angle is displayed, Accucadd replaces the **d** with a degree sign (^{o}). If no units are specified, Accucadd assumes the current setting.

For example, **10d15’** is 10^{o}15’ (10 degrees and 15 minutes), and **20d18’17"** is 21^{o}18’17" (21 degrees, 18 minutes and 17 seconds).

Use explicit units to over-ride the current setting. **r** specifies radians, **g** specifies grads.

Distances

Prefix negative distances with a minus sign (`–’).

Units of length are specified by abbreviations of their names. For example, **20mm** is 20 millimeters, and **4 mi** represents four miles. If no units are specified, Accucadd assumes the current units, as shown on the Status Bar.

Angle conventions (see Set Up: Precision)

You can use two angle conventions: “Clockwise from West” or “Anti-clockwise from East”. The latter convention is usually used by mathematicians, the former by draftsmen.

You can select the angle convention to be used with Set Up: Precision.

Units

The full list of units is:

Millimeters	mm	1/64ths	/64"
Centimeters	cm	Inches	“ or in
Meters	m	Feet	‘ or ft
Kilometers	km	Miles	mi
Degrees	d (shown as)		
Minutes	‘	Radians	r
Seconds	“	Grads	g

The representation of both angles and lengths with ‘ and “ is not ambiguous, as any given input is expected to be either a length or an angle, never a choice.

Decimal Numbers

Numbers can be typed as a decimal fraction (i.e. with a decimal point) unless they are part of a degrees-minutes-and-seconds angle input, where the forms are restricted thus:

45.333333d	is valid
45d20.123’	is valid
45d20’14.7"	is valid
45.2d15’	is not valid
45d15.2’10"	is not valid

In effect, only the last part of the angle specification can have a decimal point.

Fractional Numbers

Enter English fractional numbers like this:

3 / 8	three eighths (of an inch)
1 (space) 3 / 8	one and three eighths of an inch note the space.

Note that 13/8 (with no space) means thitreen eighths or one and five eigths inches.

1 ‘ (space) 3 (space) 3 / 4	one foot, three and three quarter inches. Note the space. Don’t use (1’ - 3 3 / 4) as this means 1 foot subtract 3 and ¾ inches, or 8¼”

Exponents

Exponential notation can also be used for numbers. This is a shorthand way of writing in scientific notation (i.e., in terms of powers of ten). An exponent is signaled with an **e** or **E**, like this:

2.77e3	is	2770	i.e. 2.77 x 10
599E-3	is	0.599	i.e. 599 x 10
23e0	is	23	i.e. 23 x 10

Spaces are not permitted before or after an **e** used in this way, so numbers can be recognized unambiguously. For example:

2.77 e3	would not be recognized as a number (contains a space before the “e”)
2.77e3	would be recognized (no spaces)
2.77 e 3	is not valid - spaces both sides of the “e”
2.77e 3	is not valid either - space after the “e”

Formulas

Simple formulas can be entered in place of numbers:

12 + 17.5	(add the two numbers)
22 - 3	(subtract second from first)
6 * 9	(multiply the numbers)
22 / 7	(divide first by second)

If you use brackets, formulas can be nested thus:

(50 + 10) * (3/8) (= 22.50)

Surplus levels of brackets do no harm as long as they are correctly matched. They can be useful if you wish to recall inputs with the **=** key (see above).

Units in Formulas

You can specify units in formulas, if you need to work in mixed units on a drawing. For example, when working in Metric units, entering:

14" / 8 Enter

is perfectly valid. The distance is converted to metric units, and will be displayed as such. You cannot enter more than one set of units in a formula, thus:

14" / 8 cm Enter

If you do, an error message is produced.

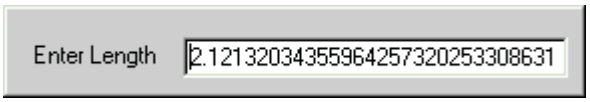
Using the Windows Calculator

You can use the Windows Calculator with Accucadd. Open the Calculator (typically using Start: Programs: Accessories: Calculator) and carry out the calculation you need. Use Edit: Copy or Ctrl-C to copy the result (to the clipboard). In Accucadd, type 0 (the figure zero) followed by the backspace key. The effect of this is to call up the numeric data entry window. Press Ctrl-V to paste the calculated value into Accucadd.

As an example, suppose you wish to draw a line of length 4 sin(45º). In Accucadd, click the start of your line. Switch to the Windows calculator, and type in (or click in) the sequence:

3 * (4 5 sin) =

and then press Ctrl-C to copy the result (2.12132034355964...). Return to Accucadd, ensure your line starts where you want it to, stretch it in the desired direction, then type 0 Backspace Ctrl-V (to call up the data entry window and paste the calculator result.



When you have done this, press Enter (to draw the line) or F11 (to update to that position without drawing).

Entering points

It should be clear by now that almost all Accucadd drawing functions work by specifying a series of points in the drawing. This is done with the Mouse, aided by the grids and traps, and by entering sizes as a short-cut, with precise positioning.

There are two types of keyboard input that help in entering points:

X and Y coordinates

The first is direct input of the X and/or Y coordinates of the cursor. This is intended to help with use of the Mouse, rather than taking over from it completely.

The coordinate system used for X and Y input is conventional, with X increasing from the origin towards the right-hand edge of the screen, and Y increasing towards the top of the screen. The origin of the coordinates is the most recent Handle placed in the drawing, or the center of the drawing paper if no Handles have been drawn.

The Handle is used as a Datum Handle (see Draw: Elements: Handle). To enter a coordinate for the cursor, and lock it at that coordinate, simply press function key 1 (written **F1**) for an X input, or the second function key (**F2**) for Y input. Type the coordinate value, then press **Enter**. For example:

F1
47 Enter

would move the cursor to a position where its X coordinate was 47 and lock it there. You can move it with the Mouse along the X=47 line, or free it from the line with **Esc**. If you are using any Traps, X and Y inputs with **F1** and **F2** will override them.

Note: X and Y input are an alternative to using Toolkit: Orth Trap, and can be used with Toolkit functions which are incompatible with Orth Trap. If their effects would conflict with a Toolkit function, they take precedence.

Point Input

It is also possible to enter points directly from the keyboard, irrespective of the function you are using. This can be used for:

Drawing
Positioning Inserts
Creating snap points as guides for drawing

Types of Point input:

Offset Mode is used to position cursors, by specifying a position by offset from the most recent position placed in the drawing (e.g., the end of the last line drawn, or the first corner of a box, when the program is awaiting the position of the second).

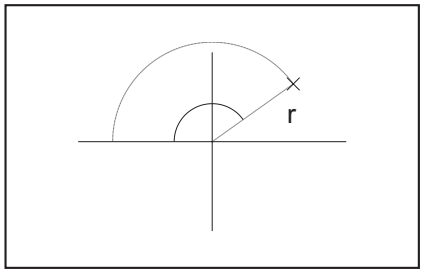
Making an offset mode input has exactly the same effect as moving the cursor to the indicated position and clicking the button. It is most useful in creating drawing elements at arbitrary points and in positioning Inserts.

Position Mode is used to place snap points, and is independent of the drawing cursors. It allows the positioning of the snap point by reference to the most recent Handle placed in the drawing, or to the center of the `drawing paper' if no Handles have been used. It is advisable to switch on the display of snap points, using Toolkit: Points, when using position mode, so that you can see the points you create.

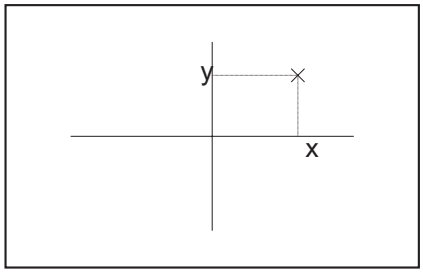
Position mode is most useful in creating a large number of points to be joined later. This is useful in entering data measured from a real object, rather than in designing. It can also be used to draw graphs easily.

Snap points created with Position Mode are lost when you leave Accucadd or load a new drawing unless Save and Load Snaps is "On". This is controlled through Set Up: Snaps.

Two coordinate systems can be used for Point input:



DELTA (Cartesian X, Y coordinates)
DELTA input uses the same coordinate convention as X, Y inputs (described above). It uses Handles as Datum Handles (see Draw: Elements: Handle)



POLAR (Polar radius and angle coordinates)
In POLAR mode, the radius is measured in a straight line from the coordinate origin, and a positive angle is measured according to the currently selected angle convention. These conventions are described above; the usual Accucadd convention ("Clockwise from West") is shown to the left.

To enter a point, use the command key from the list below:

F5 Delta position mode.
Press function key 5, then type the X, Y coordinates of the snap point to be created, taking the `paper center' as the coordinate origin. If Handles exist in the drawing, the most recently drawn one is used as the coordinate origin.

For example, typing **50 mm, -4" Enter** will place a snap point 50 millimeters to the left of, and 4 inches below the last Handle (or the `paper center').

F6 Delta offset mode.
Press function key 6, then type the distances horizontally and vertically from the last point drawn to the desired cursor position.

For example, keying in **-245.375, 200 Enter** will place the cursor 245.375 current units (e.g. mm, inches) to the left of the last point drawn, and 200 units above it. It also `clicks the button' and can thereby add Entities to your drawing.

F7 Polar position mode.
Press function key 7, then type the distance between the snap point to be created and the last Handle (or the paper center). Then type the angle of the line joining the snap point and the co-ordinate origin.

For example, keying in **10.6", 13d15'22" Enter** will place the snap point 10.6 inches from the coordinate origin, with the line joining it to the origin at an angle of 13 degrees, 15 minutes, 22 seconds.

F8 Polar offset mode.
Press function key 8, then type the distance and angle of the new cursor position, as offsets from the last drawn point, as for Polar position mode.

For example, keying in **10.6", 13d15'22" Enter** will place the cursor 10.6 inches from the last point, with the line joining it to the last point at an angle of 13 degrees, 15 minutes, 22 seconds. It also `clicks the button' and can thereby add Entities to your drawing.

Updating (**F11** Key)

You can use the **F11** key to update (move) a point in all the Draw: Elements: options with offset inputs (**F6** or **F8**). Just as when entering sizes, make a keyboard input to specify the endpoint of the line, the start having already been placed. Terminating the input with **F11** will, instead of drawing the line, move the start point to the position described by the entered point.

For example, typing:

F6
100, 175.5 F11

moves the start point of the line right 100 units, and up 175.5 units, while typing:

F6
100, 175.5 Enter

would draw the line from the start point to a point 100 units to its left and 175.5 units above it.

If the start point of the line has not been positioned, **F11** has the same effect as **Enter**, planting the start point of the line (for **F6** and **F8** commands). **F11** has no effect on position inputs (**F5** and **F7** commands).

Backward compatibility

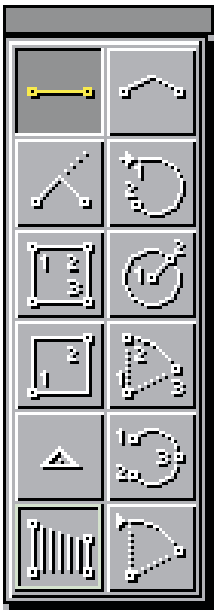
For earlier versions of our CAD products (before RoboCAD 20), letter keys were used for DELTA and POLAR inputs. The relationship between these keys and the current keys is:

RoboCAD 20 and Accucadd	Previous RoboCAD
F1	n/a
F2	n/a
F5	C
F6	D
F7	P
F8	Q

DRAW ELEMENTS

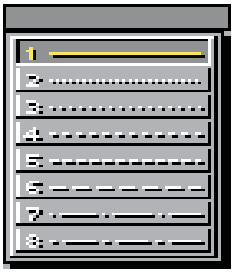
This function adds simple Entities, known as Elements, to the drawing. Three palettes are displayed, from which you can select Elements, and the way they are drawn.

Your selection on the Element type palette (the Elements palette) determines what type of Element you will draw:



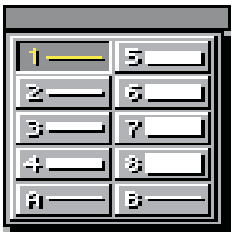
LINE	CONTINUOUS LINE
RIGHT ANGLE	BLENDING ARC
PARALLELOGRAM	CIRCLE
BOX	COMPASS ARC
HANDLE	THREE-POINT ARC
NIB	TANGENTIAL ARC

Several palettes are used to control the lines you draw. To select an element type, or a control from a palette, position the cursor over the corresponding part of the palette and click the button.



The line style palette determines how lines should appear in the drawing. There are eight styles available. If your current active layer is set to a single line style you will not be able to select a different style by using this palette.

When you print your drawings, the linestyles are rendered using the printer's line styles. You can customize these by following the procedure described in the Accucadd Tuning and Troubleshooting Manual.



The line weight palette determines how heavy (wide) the lines are. You have a choice of eight weights from 1 to 8 pixels wide, the default being 1. Weights A and B are for dimensioning - see below.

When you print your drawings, you can use wide pens and multiple pen strokes to print your line weights at any width you choose. The procedure is described under Output: Print.

To select a color for drawing, click on the Color box of the Status Bar, then move the cursor over the desired color and click. If the current Layer is set to a single color (See Set Up: Layer Table), the color

number is shown on the Status Bar and you cannot select a different color. Accucadd: Operation illustrates the Status Bar and gives more information on it.

Layers

Before you can draw, you must select a Layer to draw on. This is the `Active Layer' — to select it, click on the Layer box of the Status Bar, and enter the name or number of the desired layer. Accucadd: Operation gives more details.

If you don't have an Active Layer, you will not be able to draw anything (although you can use the Insert functions). All the drawing functions will appear to work normally, but Accucadd will not keep a record of their use, either on the screen or in your current drawing.

Snap Points

The start and end points of each Element, the centers of circles and the corners of boxes and nibs are Snap Points. This means that they act as `magnets' attracting the cursor whenever it moves near to them. This action may be switched off using the Snap facility of Toolkit: Points.

Dimensioning

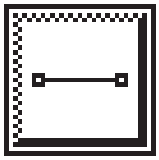
Normally, you will dimension your drawings using the Dimension menu functions. These are extremely powerful, and allow you to create Dimension Entities, which can be edited as single Entities, and adjust to editing and stretching automatically.

However, you will sometimes need to create dimensions `by hand'. Line weights A and B are used to mark Entities as part of the drawing's dimensioning: you should draw dimension lines in line weight B and dimension text and arrowheads in line weight A. Accucadd recognizes Entities drawn in this way as part of the drawing's dimensioning, and will hide them when you use View: Speed Filter to conceal the dimensioning.

Printing dimensions

Dimension lines created by Dimension Entities are printed as if they were drawn in line weight B; dimension text and arrowheads as if they were drawn in line weight A.

LINE draws a line between two points.



This is the default element selection; it can be re-selected at any time. To draw a line, position the cursor at the start point and click the button. Then, as you move the cursor, the line connecting the start point to the cursor will stretch like a rubber band. Position the cursor at the end of the desired line, and click the button again to draw the line.

Alternatively you may type the line length on the keyboard. If you do this, the line's direction is based on the direction indicated by the cursor. This can be controlled precisely using the Orth and Angle traps.

To leave LINE, select another Element type from the Elements palette, or a different function from the menu.

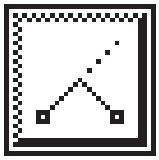
To draw several lines end-to-end, use CONTINUOUS LINE (q.v.).

Details: To cancel an incorrect start point, press **ESC**.

Lines can also be drawn by entering their start and end points, using function keys for X and Y keyboard input, or Delta or Polar position offsets. These are explained in Draw: Keyboard Input. That section also explains how to move the start point of a line after it has been planted (using **F11** instead of **ENTER** to terminate an offset input).

ELEMENTS: RIGHT ANGLE DRAW

Right Angle draws two lines, at right angles to each other.



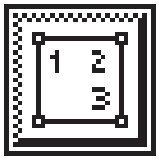
Position the cursor at the end of the first line and click. Then, position the cursor at a point along the desired first line and click again. Move the cursor to position the corner and the end point of the second line, and click for a third time to complete the right angle.

To leave RIGHT ANGLE, select another Element type from the Elements palette, or another function from the menu.

Details: This function can also be used via function keys for X or Y keyboard input, or by defining the position of the second and third corners using Delta or Polar offsets. These are described in Draw: Keyboard Input.

DRAW ELEMENTS: PARALLELOGRAM

PARALLELOGRAM constructs a parallelogram or a rectangular box.



Position the cursor and click the button to plant the first corner of the parallelogram, then move and click again to position the first side.

Move the cursor — the size and shape of the parallelogram is shown on your screen. To draw it, position the third corner with the cursor and click the button a third time.

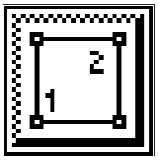
If you put a corner in the wrong place, use a right click or press the Esc key to back up through the sequence.

To leave PARALLELOGRAM, select another Element type from the ELEMENTS palette, or a different function from the menu.

Details: parallelograms may also be drawn using function keys for X or Y keyboard input, or by defining the position of the second and third corners using Delta or Polar offsets. These are described in Draw: Keyboard Input.

ELEMENTS: BOX DRAW

BOX is used for drawing a rectangular box.



Position the cursor and click the button to plant the first corner of the box.

Move the cursor — the size and shape of the box is shown on your screen. To draw it, position the second corner with the cursor and click the button a second time.

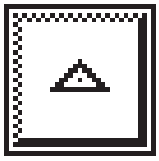
If you put a corner in the wrong place, use a right click or press the Esc key to back up through the sequence.

To leave BOX, select another Element type from the ELEMENTS palette, or a different function from the menu.

Details: Boxes may also be drawn using function keys for X or Y keyboard input, or by defining the position of the second corner using Delta or Polar offsets. These are described in Draw: Keyboard Input.

DRAW ELEMENTS: HANDLE

This element adds Handles to the drawing. These act as snap points, and can serve as reference points for X, Y, Delta and Polar keyboard inputs.



Position the cursor at the required location and click the button. To quit, select another Element type or a different function from the menu.

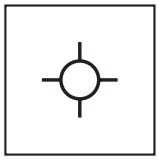
Handles are not displayed unless you switch on Display in the Toolkit: Points palette. They are part of the Layer they were drawn on and are hidden if their Layer is hidden. When visible, Handles are displayed as small triangles; Handles in the New Data (freshly drawn Handles) point upwards, whilst Handles in Inserts point downwards. The newest Handle is shown as a circle with four radial lines (see “Datum Handles” below).

When a drawing is saved in a library its Handles become Insert Handles, and are used to access the drawing when you select the Draw: Insert or Library: Load functions.

Conventions: Handles have two main uses: as location points for Inserts (Tag Handles) and as coordinate origins for keyboard input (Datum Handles). A Handle is the same object in either case; the different terms reflect its two applications.

Tag Handles Handles are used as Tag Handles when you want to link a collection of small drawings as Inserts at specific points to form a larger more complex drawing. If you plant Handles at corresponding locations in each drawing, you will be able to join them accurately by matching up the Handles.

Datum Handles These are used as coordinate origins for X, Y, Delta and Polar keyboard inputs using the function keys. You can also plant Handles themselves using the function keys, by X and Y coordinates, or by entering Delta or Polar coordinates on the keyboard in `offset’ mode, rather than by moving the cursor and clicking the button. This is described in Draw: Keyboard Input.



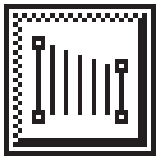
The current Datum Handle (the newest Handle in the drawing) is shown as a circle with four radial lines, if Handles are being displayed (See Toolkit: Points).

Details: Handles should be used sparingly, as too many cause confusion when using them as Datum points. A limit of 2048 Handles in a drawing’s New Data is imposed by Library: File.

Handles can be deleted using the Edit: Handles function.

ELEMENTS: NIB DRAW

NIB draws a quadrilateral which is shaded with lines. The NIB palette is produced so that you can control their spacing.



Position the cursor at the first corner of the quadrilateral and click the button, then move to the second corner and click the button again. Repeat this procedure for the third corner.

When you are about to position the fourth point, lines appear joining the cursor to both the third and first points to form a box. As soon as you click the button to fix this point into the drawing, the outline disappears and is replaced by the same shape filled with lines.

Nibs are always drawn so that they start parallel to the first line entered and end parallel to the line opposite. These lines can cross each other, producing a “curve stitching” effect.

To change the spacing of the nib lines, position the cursor over the NIB palette, click the button to get an input window and type the new spacing on the keyboard. The value is assumed to be in the current units unless you specify a unit (e.g. type 0.2" for 0.2 inch spacing between each nib line). The minimum nib spacing possible is 0.01 mm (0.0004").

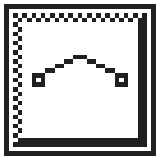
To leave NIB, select another Element type from the ELEMENTS palette, or a different function from the menu.

Details: The nib spacing is not scaled; it is in `paper units’. If you change the scale of the drawing the nib spacing adjusts to the new scale.

Nibs may be drawn by positioning their corners with the function keys for X and Y positions, or using Delta or Polar offset input.

DRAW ELEMENTS: CONTINUOUS LINE

Continuous Line draws a series of lines.



Position the cursor and click the button to draw each line. The first line drawn with CONTINUOUS LINE starts at the last point drawn; the following ones start at the end of the previous line.

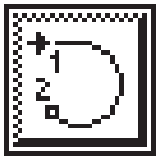
Each line drawn with CONTINUOUS LINE is quite separate: you can select individual colors, layers and line styles and weights form them, and edit them individually later. CONTINUOUS LINE is simply a `canned' special use of the LINE function.

Details: If nothing has been drawn, the first CONTINUOUS LINE starts at the center of the drawing paper.

This function can also be used via function keys for X or Y keyboard input, or by defining the position of the second and third corners using Delta or Polar offsets. These are described in Draw: Keyboard Input.

ELEMENTS: BLENDING ARC DRAW

This kind of arc starts at the end of the last line or arc placed in the drawing, whose direction determines the direction of the start of the arc.



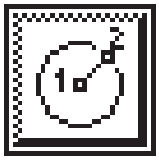
Position the cursor at the end point of the required arc. As the cursor moves, Accucadd displays the arc currently defined by the cursor. When the correct arc is displayed, click the button to draw it.

To leave this Element type, select another from the ELEMENTS palette, or a different function from the menu.

The end of one arc can be used as the start of the next arc.

Details: To draw an arc in a specific direction, or tangential to a line or arc added to the drawing at an earlier stage, use the functions Toolkit: Arc Direction or Toolkit: Line Direction.

This function draws circles.



First, define the center of the circle by clicking the button when the cursor is in the required position.

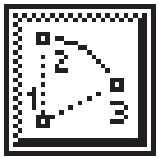
Then, to set the diameter, either position the cursor and click the button when the circle is the required size, or type a value on the keyboard. Typing a value causes Accucadd to lock the diameter of all subsequent circles to this value, so that several circles can be drawn of a constant size. To cancel this value, press **ESC**.

To leave CIRCLE, select another Element type from the ELEMENTS palette, or a different function from the menu.

Details: You can position the center of a circle by the Function keys with X and Y coordinates, or with Delta or Polar offset keyboard input. You can position a point on the circle's perimeter in the same manner, and thereby set the diameter. This will not lock the radius of the circle cursor.

ELEMENTS: COMPASS ARC DRAW

This arc is defined by radius and angle. Its sweep is determined by the radius of the arc and the specified angle.



First, position the cursor and click the button to mark the center of the arc. Then, either position the cursor and click the button to set the start point and angle of the arc itself, or type the radius on the keyboard. You can now set the included angle.

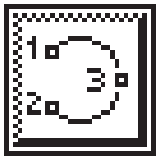
Position the cursor at the end point of the arc. As you move the cursor, Accucadd will display the current position of the arc on the screen. Again, you may type the size of the angle on the keyboard. If the arc is going in the wrong direction, move the cursor across the radius line to select the other segment.

Exit by selecting another Element type from the ELEMENTS palette, or a different function from the menu.

Details: All three points on this arc may be entered from the keyboard, using the function keys for X and Y coordinates, or Delta or Polar Offsets. Pressing **F11** updates to current cursor position.

DRAW ELEMENTS: 3-POINT ARC

This element draws an arc joining three given points.



Plant the start and end points of the required arc by moving the cursor and clicking the button as for a line. Then move the cursor to pull the arc out to the required position. Click the button again to plant this third point or enter a radius directly from the keyboard.

Exit by selecting another Element type from the ELEMENTS palette, or a different function from the menu.

Details: If the start and end points are coincident then a circle is drawn through this point with a diameter defined by the third point.

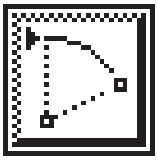
All three points defining this arc may be placed using the function keys for X and Y coordinates and DELTA and POLAR offsets. Pressing **F11** updates to current cursor position.

Hints: To draw a circle between two or three points, use Draw: Tan Circle.

To draw arcs between two points, use Draw: Fillet: Point-Point.

ELEMENTS: TANGENTIAL ARC DRAW

This arc always starts at the end of the last Element added to the drawing, blending with the line or arc direction.



First, position the cursor and click, to place the center of the circle and thus define the radius of the arc. If you prefer, you may enter the radius of the arc on the keyboard.

Next, position the cursor and click the button to mark the end of the arc. Alternatively, type the angle on the keyboard. The cursor remains at the end point ready for your next action. The arc may be reversed by moving the cursor back across the radius line.

Exit by selecting another Element type from the ELEMENTS palette, or a different function from the menu.

Details: The two points entered to define this arc may be placed with the function keys, to set X and Y coordinates, or with Delta or Polar offsets. Pressing **F11** updates to current cursor position.

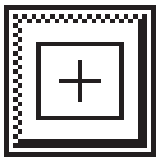
This function copies an item from a library index into the drawing, as an Insert. It differs from Drag Insert in that more complex transformations are possible, and no animated image of the item being inserted is produced .

Starting — When you select Frame Insert, your current Active Layer is turned Off. Inserts are normally `Unlayered', although they can be forced onto one Layer. This is explained in detail under Draw: Drag Insert.

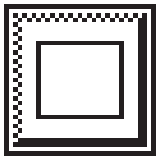
Library — Like Drag Insert, you must select a drawing from the library to Insert. The description of Drag Insert describes this process; it is identical for Frame Insert.

Frame Insert — The Frame palette is displayed with the current defined position and a free moving cross-shaped cursor for accessing the palette.

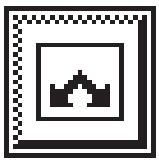
The palette contains the following icons:



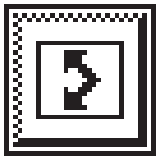
POSITION: Select this icon to define the Insert's position in the drawing. The default is the center of the screen.



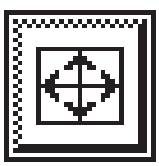
RESET DEFAULT: Select this icon to reset the palette settings to their default values.



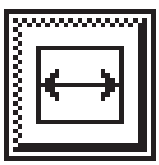
MIRROR X: Select this icon to create a mirror image by reflecting the image in the Y axis. That is, a mirror image with left and right (the X axes) exchanged.



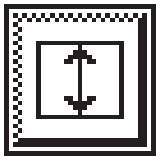
MIRROR Y: Select this icon to create a mirror image by reflecting the image in the X axis. That is, a mirror image with top and bottom (the Y axes) exchanged and left and right as they were.



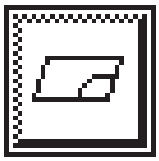
RESCALE: Alter the scale of the Insert relative to its original scale. The default (100%) is its "correct" size — the size which would keep all dimensions within it correct in the new drawing.



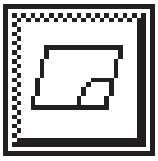
STRETCH WIDTH: Alter the Insert's width, while keeping its height constant.



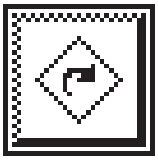
STRETCH HEIGHT: Alter the Insert's height, keeping its width constant.



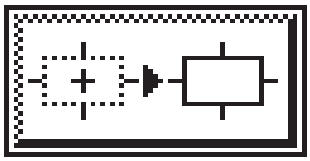
SQUASH: `Bends' the Insert frame, inclining the vertical lines, but leaving horizontals horizontal. This distorts the Insert, without changing the length of any lines. The squash angle gives the angle of the `verticals'; the frame height is reduced.



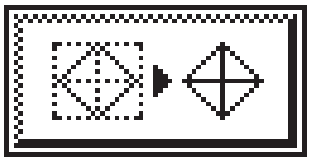
SHEAR: `Drags' the top and bottom of the Insert frame sideways, `stretching' the vertical lines so that the rectangular frame becomes a parallelogram. Horizontal lines and the frame height do not change. The shear angle shows the angle of `verticals' to the horizontal.



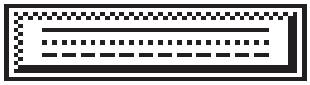
ROTATE: rotates the Insert. The default is 0^{o}. Rotation is normally measured clockwise from "west", but you can select the anti-clockwise from "east" convention using the Configuration program. For more details, see Draw: Keyboard Input.



CUTOUT: Select this icon to remove the data "underneath" the Insert. Accucadd will Erase of all the data in a rectangle round the Insert, in the same way as Drag Insert: Cutout (q.v.).

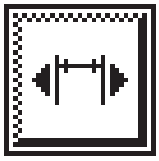


ENTER DRAG: change to Drag Insert, keeping the settings in the FRAME palette intact. This allows you to drag Inserts with complex transformations.

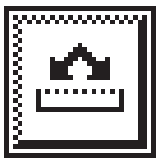


STYLE OVERRIDE: display the line style palette and allow line styles to be over-ridden.

WEIGHT OVERRIDE: display the line weight palette and allow line weights to be over-ridden.

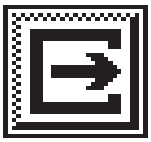


SCALE OVERRIDE: Resets the frame palette's settings so that the Insert fills the drawing paper. This facility uses Stretch Width and Stretch Height; it is intended for use with drawing frames.



TEXT OVERRIDE: Force text in the Insert to obey Mirror X and Mirror Y settings. If this isn't selected, it will ignore those settings, but obey all other transformations — which makes it easier to read.

OK: Select this icon to place the Insert into the drawing in accordance with the palette settings.



EXIT: Leave FRAME INSERT and remove the palette.

Operation: Select an icon from the palette, then move the cursor away from it and click the button again to display the Insert frame. Move the cursor to position or alter the frame, then click the button when you have established the required setting. The program leaves the dotted box on the screen as a confirmation of the Insert's current status. If you need several transformations, you will have to repeat this process for each icon.

To alter settings in the palette without manually manipulating the box, place the cursor over the value to the right of the icon and click the button. An input window appears into which you type the new value. This causes the dotted box to be redrawn according to the new setting.

To deposit the Insert in the drawing, select the **OK** icon from the palette. Alternatively, select Enter Drag to skip into Drag mode and plant the Insert by clicking the button.

Once the Insert has been copied into the drawing, the box and cursor reappear to enable you to plant more copies of the same Insert. Select the Reset Default icon to restore the palette to the default settings.

Insert Handles When you have made your first setting on the palette, Accucadd displays the Insert's handle as a small downward-pointing triangle — an `Insert Handle'. This handle is the `center' of the Insert for all subsequent transformations requiring a center.

Details: Line style and line weight changes apply to the Insert as a whole, overriding the linestyles and weights of all Entities within it. You can override colors in the same way, as described under Drag Insert. Once an Insert is planted, the program draws it out on the screen. You can stop this, just as you would a Redraw, with **Space**.

Warning: If you use Stretch, Squash, Shear or Scale Override to place an Insert which contains arcs or circles, you will not be able to Explode them fully (see Edit: Explode). Curves (drawn with Draw: Curves) will not cause this problem.

Frame and Drag Inserts placed in the drawing with Drag Insert and Frame Insert are identical; the two functions are alternate ways of planting Inserts, Drag Insert being easier to use, and Frame Insert giving more control. With respect to Layers, the Layer Table, and the conversion of `old' data, Frame Insert behaves in exactly the same way as Drag Insert, described above.

DRAG INSERT DRAW

This function copies a drawing from the library into your drawing as an Insert. It allows, if required, rotations and mirror images of the item.

Pick from Index

Accucadd presents the library index palette and an index from the current library. You can select an index using the index palette.

To select a drawing, position the cursor over one of its handles (small triangles, pointing upwards). The drawing's image will be highlighted when you move the cursor onto its handles. Click the button to confirm the selection and take the drawing back to the drawing page. If you click the button before a drawing is selected, nothing will happen. To leave Insert without selecting a drawing, select the **Exit** icon from the palette.

The Library Index palette is described in detail under Library: File

Drag Insert

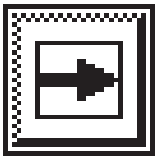
After a brief pause, the Drag palette is displayed together with the Insert you have chosen. The Insert is displayed at the correct size taking into account both its own scale and that of the drawing. For example, an Insert with a scale of 1:20 is reduced by a factor of 5 when copied into a drawing with a scale of 1:100.

This can be over-ridden if you wish to include the insert at virtually any size you wish. The over-ride controls are on the Frame Insert palette: check this if the scale appears to be wrong–it may be set to over-ride.

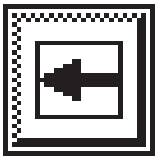
The current layer box on the Status Bar displays "OFF" — you have no current layer, and any Inserts you draw will be placed on their original layers. See "Unlayered Inserts", below.

The icons on the DRAG palette are:

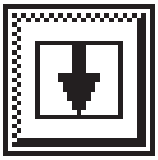
NORMAL: Select this icon to place the Insert upright.



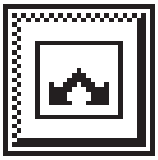
RIGHT: Select this icon to place the Insert facing right (rotated 90 degrees).



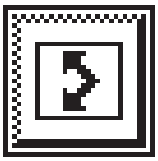
LEFT: Select this icon to place the Insert facing left (rotated 270 degrees).



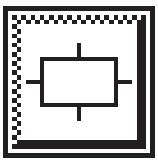
DOWN: Select this icon to place the Insert upside-down (rotated 180 degrees).



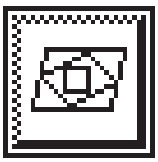
MIRROR X: Select this icon to create a mirror image by reflecting the image in the Y axis. That is, a mirror image with left and right (the X axes) exchanged.



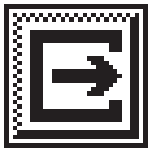
MIRROR Y: Select this icon to create a mirror image by reflecting the image in the X axis. That is, a mirror image with top and bottom (the Y axis) exchanged, and left and right as they were.



CUTOUT: Select this icon to remove the data “underneath” the Insert when you place it in the drawing. This causes an automatic ERASE of all the data in a rectangle bounding the Insert, just as if GROUP: CUT BOX had been used for the ERASE. CUTOUT is explained in more detail below.



FRAME: Select this icon to switch to the FRAME INSERT function for more complex transformations, retaining any settings already made.



EXIT: Select this icon to leave DRAG INSERT

Select any transformations required from the palette, by positioning the cursor over the relevant icons, and clicking the button. As soon as you select an option, the Insert’s image is redrawn to reflect the new

setting. To deposit the Insert in the drawing, move the cursor to drag the Insert into the required place and click the button.

If you require more complex transformations (e.g. size, line style or line weight modifications) select the Transform icon to change to Frame mode. Any transformations you have made in Drag are retained by Frame.

Once the Insert has been placed in the drawing a duplicate image is displayed to allow you to deposit several copies of the same item. You can make further changes to the palette settings before planting other copies, if you wish.

Details: After you select a drawing to Insert from the library index, there is a pause while the image of the Insert is created for you to drag. A `please wait' prompt is produced on the Status Bar during this process. You can interrupt it with **Space**, just as you would interrupt redrawing on a Zoom, Shrink or Pan, but the image that you drag will be incomplete. This can still be useful if you are inserting a drawing with a border and a mass of fine detail.

Text, Mirror X and Mirror Y — By default, text in the Insert ignores the Mirror X and Mirror Y settings. This makes it easier to read; in RoboCAD 20 and previous versions, it obeyed the Mirror settings. If you turn on the Text Override icon in the Frame Insert palette (q.v.), text will obey the Mirror settings when Drag Insert is used.

Insert size — Normally, Accucadd draws Inserts at their "correct" size — any dimensions within them remain correct. If you use the Rescale function of Frame Insert (via the Frame icon on the Drag palette), you can magnify or reduce the Insert.

Editing Inserts — Inserted items are seen as a single Entity rather than a collection of Entities and so cannot be edited on an Entity by Entity basis. To alter individual Entities, use the Isolate function, or Load the required item from the library. Amend the item as required, then File it. You can either File it in a new box, or over-file the original. Check the sections on Edit: Isolate and Library: File for a full explanation of the differences.

Alternatively, perform the insertion, then change the Insert to a set of separate Entities with Explode. When you perform any Group Edit functions on Inserts you are given the choice to Explode the Insert.

Unlayered Inserts — If you simply place an Insert, without selecting a Layer for it, you create an Unlayered Insert. This type of Insert does not belong to a specific Layer: the Entities which make it up are placed on their original Layers (the Layers they were first drawn on) and are shown according to the Layer Table settings of those Layers.

If you hide all of the Layers that an Unlayered Insert occupies, the Insert's Handles, which don't belong to any Layer, remain visible and can be selected for editing.

Layered Inserts

If you select an Active Layer in the process of placing an Insert (select it from the Status Bar, which normally shows "OFF" while DRAG INSERT is in use), you create a Layered Insert. All of the Entities in a Layered Insert are forced onto the selected Layer and shown according to the Layer Table settings for that Layer.

If you hide this Layer, the whole Insert is hidden, including its Handles, and it therefore can't be selected for editing.

When you leave Draw: Drag Insert, your old Active Layer is re-selected for drawing.

Using Layering

The use of Layered and Unlayered Inserts depends on the drawing technique: if you create large components, including labels and dimensions, these should use several Layers and you should place them as Unlayered Inserts. If your components are simple pieces of geometry, with all of their Entities belonging to one Layer, it is often appropriate to place them as Layered Inserts. There are usually a large number of such components, and it is very useful to be able to hide them completely.

It is often appropriate to use both techniques when making up a large drawing. For example, when creating sub-assemblies, place the simple components as Layered Inserts and add further drawing work, labels and dimensions on their appropriate Layers. When completing the drawing, place the sub-assemblies onto the final drawing as Unlayered Inserts, so as to preserve the Layering.

You can move an Insert from one Layer to another, or transform Layered Inserts into Unlayered Inserts, or vice versa, using Edit: Move.

Color overrides

You can `override' the colors of Entities within an Insert if you select a fist layer (Layered Inserts, above). This will force the whole Insert to the same color, which you can select from the Status Bar. Draw: Elements describes color selection.

Inserts and Libraries

Inserted items become `Components' of the drawing they are inserted into. This means that if they are subsequently changed and re-filed in the same index position from which they were inserted, the changes will take effect in all of the drawings they are components of. This occurs because making an Insert does *not* add all the entities of the Insert to the drawing. Rather, it makes a note of which drawing has been inserted. The Insert is then automatically Loaded whenever the drawing it is a component of is Loaded.

Therefore, if drawings A and B both have another drawing, C inserted into them, and C is altered, then the change will be visible in both A and B when they are next Loaded or Printed. If C were Loaded, altered, and Filed at a different index position, creating a new drawing, D, no change to A or B would be made thereby.

The consequences of the component management system are fully discussed in Appendix D, “Library Management”.

Warnings: There are limits on the numbers of Inserts and Insert Handles that can be placed in a drawing. These are given in the explanation of Drag Insert in Appendix D, “Library Management”.

Backward Compatibility You can Insert drawings made with any previous version of Accucadd; drawings made with RoboCAD 20 or an earlier system are converted to the Accucadd format when you Insert them, and Filed in that format automatically when you File your drawing.

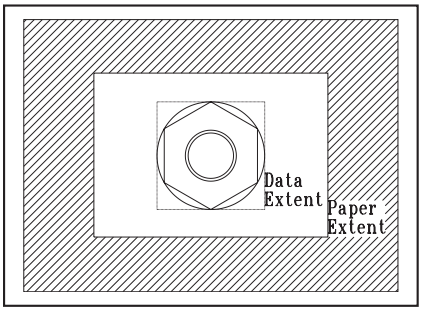
If you Insert a drawing made with RoboCAD 3.0 or earlier, layer and color information is added to it. All data Entities in the Insert and any sub-inserts it may have are given color number 0 and Layer 0 as their `original’ attributes. If you have an active Layer when you Insert an `old’ drawing, it will be placed on the active Layer, and the attributes of the active Layer will override those of the data. If it is Unlayered, it will be shown with the attributes of Layer 0.

Advanced The `origin’ of the transformations of the Insert is the Handle by which it was selected from the library. If the Insert has several handles, the results of transforming the Insert will depend on which handle you used when you selected it from the library. This handle is the point about which rotations will be made, and a line through that handle will be the “mirror” for reflections.

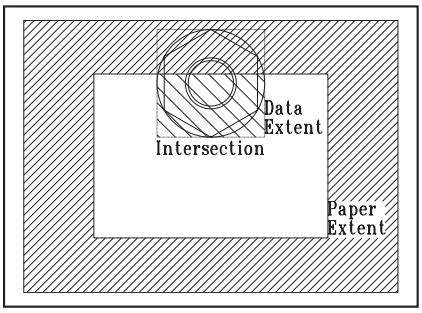
This section explains the effects of the CUTOUT icon in DRAG INSERT (and FRAME INSERT).

Basics: For simple use of CUTOUT, you will not need to be familiar with the material below. You should bear in mind that CUTOUT erases the data `underneath' the box surrounding the Inserted drawing. The effect is the same as using EDIT: ERASE with CUT BOX selected on the GROUP PALETTE (see EDIT: GROUP). INSERTs and FIT INSERTs are removed if their Handles lie within the box; NIBs are removed if one of their corners is included, likewise HATCH seed points and STREAM and CURVE end points.

Details: For a fuller explanation, some terms must be defined:



The Data Extent of an Insert is the box surrounding the Insert's data. Note that this includes Inserts nested within the Insert, not just the New Data. The Paper Extent of an Insert is simply the borders of the paper on which the Insert is drawn.

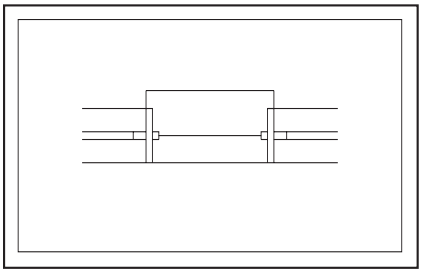


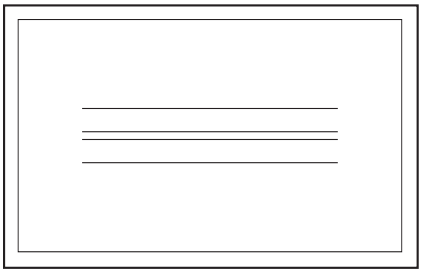
Normally, the Data Extent lies completely within the Paper Extent, and is used to define the CUTOUT box. It is possible, however, to create Inserts with part of their Data Extent outside the Paper Extent. The easiest way to do this is to reduce the Paper Size of the drawing after drawing its data. Changing the drawing scale and using EDIT: MOVE can have the same effect.

When the Data Extent extends over the edge of the Paper extent, CUTOUT uses the rectangle that lies within both Extents (their Intersection). This allows you to CUTOUT data underneath part, but not all, of the Insert. If the two Extents don't overlap at all (not easy to draw, but possible), CUTOUT uses the Paper Extent.

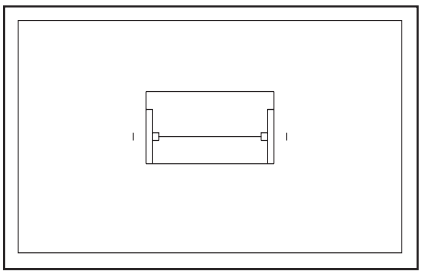
Architectural Example Consider a window frame that must be placed in a cavity wall:

The cavity must be blocked off; the correct drawing will look like this:

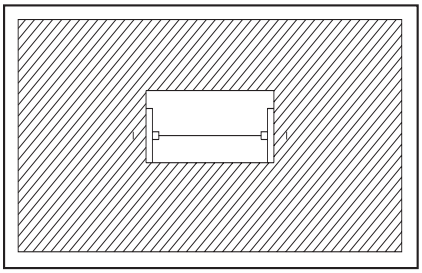




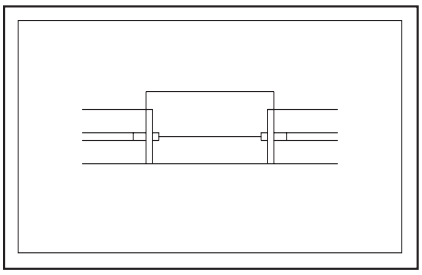
You can do this with one use of DRAG INSERT and CUTOUT, starting with a drawing of a wall like this.



Draw the window frame as a component for Inserting, centered on its paper, and with lines to block the cavity at each side.



Reduce the paper size of the window drawing, so that the blocking lines are outside the Paper Extent and it fits snugly round the window itself. FILE the window and LOAD the drawing of the wall.

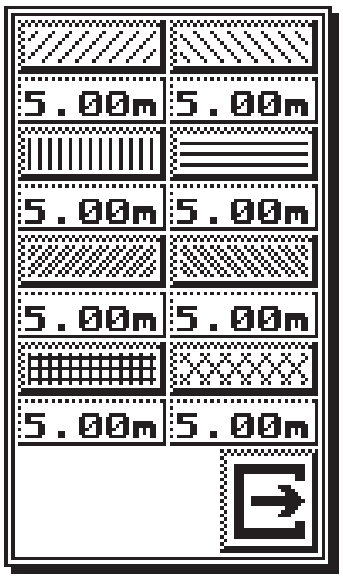


DRAG INSERT the window into the drawing of the wall with CUTOUT selected. The part of the wall under the window is removed; the parts between window and blocking lines aren't under the Intersection of Paper and Data Extents, so they aren't removed.

Hatch and Data Extent

A hatched area can have an unexpectedly large Data Extent. The box used to limit the hatched area (see DRAW: HATCH) is used to define the Data Extent, and this can be much bigger then the actual hatched area. To avoid problems, keep the box closely fitted round the hatched area when using DRAW: HATCH.

This function fills closed areas with hatch patterns.



A palette is displayed, showing the patterns available, the current spacing for each pattern, and an **Exit** icon for leaving Hatch.

First, select a hatch pattern from the palette. To set the spacing between the lines forming the hatch pattern to a specific distance, position the cursor over the box beneath the pattern, click the button and enter the value required on the keyboard. Then position the cursor inside the region to be hatched and click the button to confirm your selection. This places the hatch `seed'.

A box cursor is then enabled, which is used to enclose the area to be hatched. Plant the first corner of the box and then move to the diagonally opposite corner and plant the second corner. The region is now hatched — there may be a brief pause for a complex area. The box acts as a boundary of the hatched region, in case the region itself is not completely enclosed.

You can apply any of the line weights, line styles, and colors to your hatch pattern, giving a vast number of different hatch pattern combinations.

To leave Hatch, select **Exit** from the palette.

Conventions: It is often useful to place a drawing's main hatching in a layer of its own, so that it can be hidden to speed up work on the drawing and its colors can be controlled. (You can also use View: Speed Filter to hide hatching while you are building up the hatch layer.)

Drag Insert See `Hatch and Data Extent' under Drag Insert: Cutout for notes on using Hatch with that function.

Warning: Do not Insert a drawing containing a hatched area that has an arc or circle in its boundary, while using the Squash, Shear or Stretch functions of Frame Insert. Even if the Hatch is in an Insert nested within the drawing being inserted, the Hatch will not be drawn. Exploding such an Insert will destroy the Hatch (see Edit: Explode). Curves (drawn with Draw: Curves) do not cause this problem.

Advanced: Note that the hatch spacing is entered in `paper units', rather than `drawing units'. This means that it is not corrected for the drawing scale, but specifies the real gap required between lines on a printed version of the drawing, on the paper size currently selected. Subsequent changes in the drawing scale will alter this spacing to maintain the appearance of the drawing.

Hatch automatically finds the closet boundary around the seed point. It does this by joining elements "head to tail." For this to work, the head of one element must be the same point as the tail of the next. If ele-

ments don't join–there's a gap or they overlap–the hatch will "leak" and be stopped by the bounding box.

DRAW CURVE

This function adds fitted curves to the drawing.

On selecting Draw: Curves you are presented with the Point Selection palette, the Curve Types window and the Tune Curve palettes.

The Curve Type window determines what kind of curve is drawn. The Point Selection palette determines the way in which points are picked and the Tune Curve palette lets you manipulate the curve either as a whole entity, or at its pickup points.

To select a particular curve type, position the cursor over one of the options in the curve type window and click the button. Please remember that everything you do from now on depends on the curve type that you have chosen.

Ellipse The ellipse is generated from axis end points and can be edited to give partial ellipses. To draw an ellipse, place two Pickup points at either end of the major axis and two Pickup points at either end of the minor axis. The ellipse will be drawn automatically.

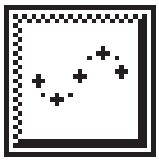
Bezier This a cubic parametric curve interpolated around four Pickup points. This curve passes through the first and last points. When you plant the fourth point, the curve cursor appears–you don't need the Tune icon.

B-Spline This is a cubic parametric curve interpolated about any number of Pickup points (minimum five). This can be open or closed.

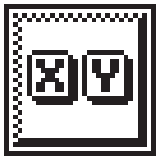
Q-Spline This gives a "best fit" curve which passes through all Pickup points. You will need to place a minimum of five points.

Curve Fit This is a series of cubic splines passing through each point. You can define tangent angle and modulus for each point separately or for all points on the curve. You will need to plant a minimum of five points.

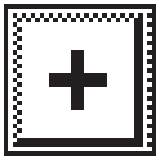
Drawing Curves The Curve Points palette contains icons which allow you to enter the points which will be used to generate the curve. As each point is entered it is marked on screen with a small `curve point' shape.



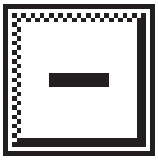
PICK: This is the default selection. It allows you to PICK points in serial order using the cross cursor which responds to snap and grid points. You can delete points while in this mode by pressing the right hand mouse button.



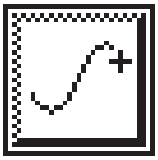
KEY: This can be selected at any time using the cursor. Select this icon to enter points as (X, Y) coordinates from the keyboard. The coordinates that you enter will be offset from the last planted point.



INSERT POINT: Select this icon to enter a new point in a finished curve sequence. To insert into the middle of the sequence, you specify the point after which you wish to enter the new point. You can do this by picking the point or you can enter the coordinates of the new point at the keyboard. To do this, select the Key icon; you will be prompted for the number of the new point and then its coordinates. The new point will be offset from the last point planted.



DELETE POINT: This deletes a selected point in a finished curve sequence. You are prompted to enter the number of the point to be deleted or you can Pickup the point using the item cursor.



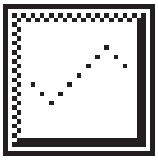
TUNE: This acknowledges the end point of the curve and activates the Tune palette, (this is done automatically in the case of Bezier curves and Ellipses).

IMPORT: This lets you import ASCII files containing the coordinates of a series of Pickup points. The format of these files is described below. To use Import, first select a curve type and then plant a Pickup point (to be the origin of your curve), using any of the methods listed above. Select the Import icon, type in the name of the file and press **Enter**.

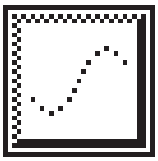
OK: Select this icon to Fix the curve after you have finished tuning it. If you are adding a curve to a large drawing, you may get an “Insufficient Memory” warning. To overcome this reduce the number of Pickup points and/or the Curve Step setting.

Curve Tuning

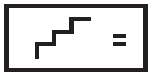
The Tune Curve palette allows you to tune the curve in various ways. The `tune’ facilities available depend on the curve that is chosen. You can tune a curve as a whole, or by selecting individual Pickup points.



LINE TRACE: Select this icon if you want the cursor trace to be displayed as single straight lines joining the points. This is the preferred display for maximum redraw speed.



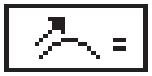
CURVE TRACE: Select this icon if you want the trace cursor to be displayed as short straight lines according to the curve step setting. Use this for accurate positioning.



CURVE STEP: Curves are drawn by linking a series of short straight lines. The number of lines between each Pickup point on a curve is determined by this icon. When you select it, you are prompted to enter a number from 1 to 32. The step you choose at this stage will be the curve step setting that is fixed.

Curve Fit controls

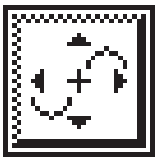
The following two icons have value windows which allow you to specify an angle in degrees for Tan Angle and a magnitude as a percentage for Tan Modulus (See Select All below).



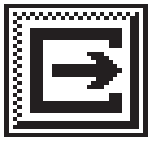
TAN ANGLE: This allows you to set the Tan angle for individual Pickup points (the angle at which a line passes through a point). This can be set for each individual point on a curve.

Click on the icon, then select a point and move the cursor, or select the value window and enter a new value in the window that appears at the bottom of the screen. This function is only available with Curve Fit.

TAN MODULUS: This controls the magnitude of a line as it passes through a point. Use this to set Tan Modulus for individual Pickup points on the curve, an the same way as Tan Angle.



SELECT ALL: If Tan Angle or Tan Modulus value windows are selected while Select All is active, then any values entered will become true for every Pickup point on the curve. It is active by default, and is turned off by the Tan Modus and Tan Angle icons.



EXIT: Leave Draw: Curve.

Details: For the purpose of editing, curves behave in the same way as Elements. For more information on how to edit Elements, see section 6 of this manual, Edit. Curves are assembled from a group of lines, and can therefore be used in Inserts which are Squashed, Sheared or Stretched using Frame Insert without problems (see Draw: Hatch and Draw: Frame Insert).

Exploding Curves: You can use Edit: Explode to turn a curve into the corresponding set of individual straight lines.

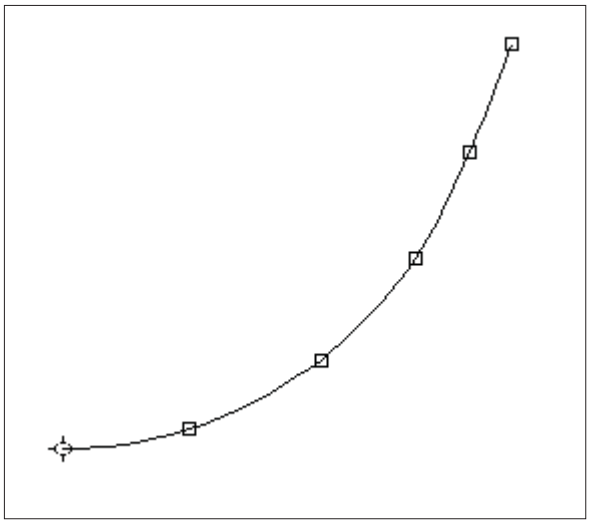
Hint: To construct tangents to curves, use Toolkit: Data Snap.

IMPORT Files: You can generate such files using the Accucadd Draw: Text (and selecting File: Save), or a word processor which has a facility for creating ASCII text files, (e.g., Notepad, Word - Save As MS-DOS Text). The file should be structured as follows:

Each pair of coordinates should occupy one line of the file. The first value is read as the X coordinate and the second value is read as the Y coordinate. These should be separated by a space or a comma. If your file contains abbreviations for units Accucadd will use these units when planting the points. The same abbreviations should be used as for Accucadd keyboard input (see Draw: Keyboard Input). If there are

no unit abbreviations attached to both of the coordinate values Accucadd will use the current units.

The following table produced this Q-Spline curve:



1.13, 0.18 ↵
2.30, 0.80 ↵
3.14, 1.70 ↵
3.62, 2.64 ↵
4.00, 3.60 ↵

Advanced: Curve points can also be planted using keyboard input, as described under Draw: Keyboard Input.

F6 (Delta Offset) and **F8** (Polar offset) inputs will enter curve points.

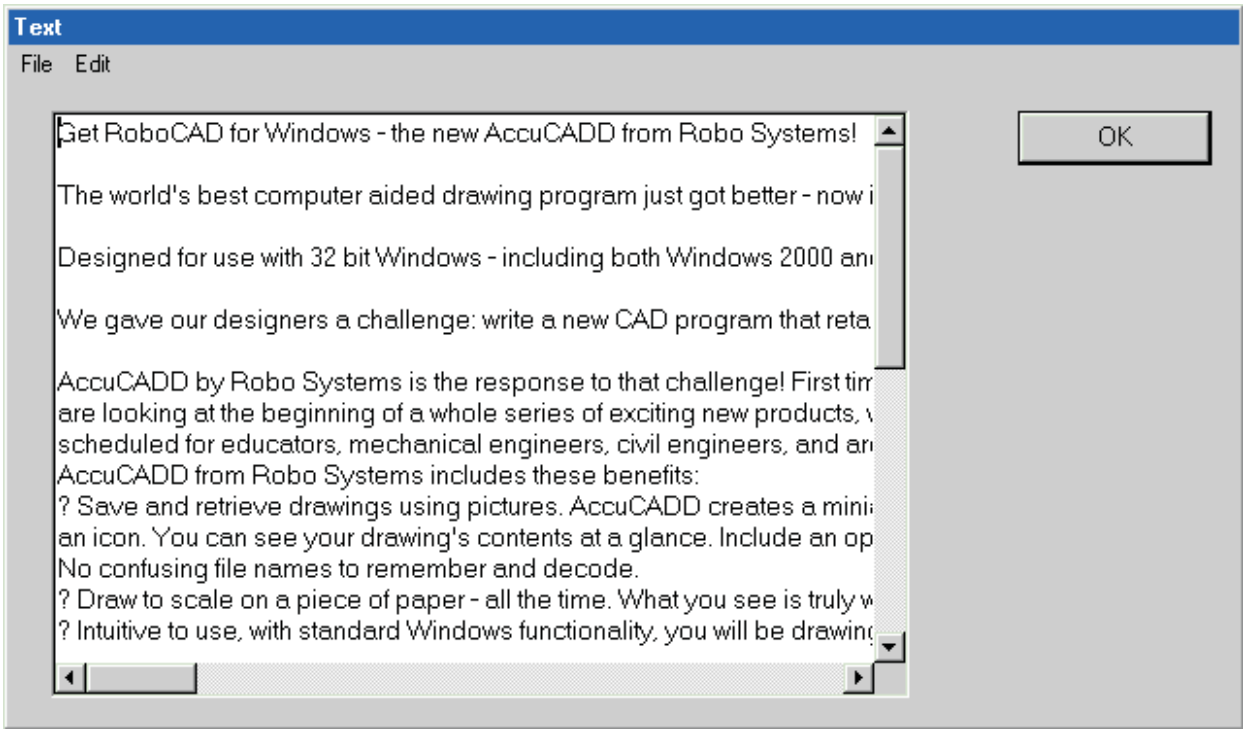
F5 (Delta position) and **F7** (Polar position) inputs will add snap points on which Pickup points may be planted.

DRAW TEXT

This function adds text to a drawing. You can use it to create drawing attributes for use with Accudata as well as labels and dimensions.

Entering text

When this function is selected, the Accucadd Text Editor is entered. This presents a bordered screen, and a flashing cursor in the top-left corner. Type the desired text on as many lines as required, pressing **ENTER** to terminate each line.



This text editing window works very much like Windows Notepad. You can use the arrow keys, Home, End, and the mouse to move the cursor. To delete a character, move the cursor to its right and press **Back Space**, or to the left and press **Delete**. You can select text by double clicking, shift-clicking, or shift-keyboard in the usual way. Selected text can be deleted, copied, or replaced as a block. Ctrl-Z works as a (limited) Undo.

To insert characters, position the cursor at the point where the new text is to start, then type the extra text as before. The text to the right of the cursor moves to accommodate the additional text.

The File menu allows you to Open an exiting text file, and use it in Accucadd. Likewise you can Save Accucadd text to a file. The Edit menu gives you explicit Clear (Cut), Copy and Paste commands.

Click OK to return to the drawing page when the text is complete.

Move the cursor, which shows the size of the text block you have entered, to the required position, then click the button to place the text in the drawing.

Drawing text

The text palette allows the text's attributes to be changed. The icons and functions in the text palette are:

STYLE: This allows you to save the current settings for the following attributes as a Text Style: Font; Text Height; Line Spacing; Text Spacing; Text Slant; Justification; ISO selection; Rotation; Line weight.

Select the current Style name, shown next to the Style icon; a window is displayed which will give you the option to save or load a Text Style. When one of these options is selected the Windows File: Open dialog is displayed.

You can Load (Open) a Style by either selecting one of the Styles listed in the catalog, (you can scroll up and down the catalog), or typing the name of the Style into the window at the bottom of the screen (remember to press **Enter**). To Save the current attributes as a new Style, select the "save" option and key in a name for the new style in the prompt window that appears at the bottom of the screen, or overwrite an old Style by moving the cursor over one of the entries in the Style catalog and clicking the button.

FONT: A window contains the font number and the font name. When you select it, the font catalog is displayed from which you can select a new font. You can scroll up and down the catalog in order to view all of the available fonts.

To select a font, position the cursor over the one that you want and click the button, or type the font name in the window at the bottom of the screen and press **Enter**. You can alter all of the attributes of any of the fonts and of course each font can be incorporated in a Accucadd Text Style. Accucadd is supplied with 25 text fonts. They are listed under Draw: Text Fonts.

TEXT HEIGHT: This is the height of the text — the height of the capital letters. The default is .25 inches.

To change the Text Height, select the value window opposite the Text Height icon. A window will be displayed at the bottom of the screen. Key in the new Text Height and press **Enter**. There is no maximum limit to text size other than the size of the paper; the smallest possible text size is 0.01 mm (0.0004").

LINE SPACE: This is the inter-line spacing between each line of text. The default spacing is 40% of the Text Height; it is set to that each time

the Text Height is changed. See `Advanced:', below, for details of using this setting.

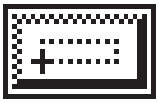
To change the line spacing, select the value window opposite the Line Space icon and a window will be displayed at the bottom of the screen. Type the new line spacing (a distance, not a percentage) and press **Enter**. The maximum line spacing is 16,645.382 in.

TEXT SPACE: This is the size of the space inserted between each character in a line of text, (this includes blank space characters). The range of values you can enter is between 0 and 16,645.382 in.

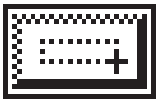
To change the Text Space select the value window opposite the Text space icon and a window will be displayed at the bottom of the screen. Key in the new value and press **Enter**. Text Space changes proportionately with Text Height.

TEXT SLANT: Text can be slanted at any angle between -63° to +64°. The default Text Slant is 0° (vertical).

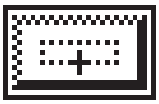
To change the slant angle, select the Text Slant icon and a window will be displayed at the bottom of the screen. Key in a new value and press **Enter**. If you have only one line of text, the text cursor shows the slant.



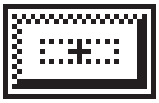
LEFT JUSTIFICATION: Select this icon before planting the text cursor if you want all text to be left justified. The text handle is displayed at the lower left hand corner of the text box.



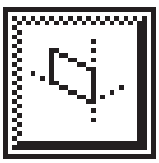
RIGHT JUSTIFICATION: Select this icon before planting the text cursor if you want all text to be right justified. The text handle is displayed at the lower right hand corner of the text box.



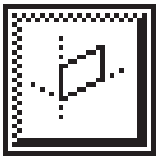
CENTER JUSTIFICATION: Select this icon before planting the text cursor. This centers the text within the text box. The text handle is displayed at the bottom center of the text box.



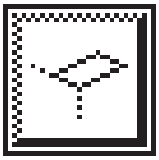
MIDDLE JUSTIFICATION: This is the same as center justification with the exception that the text handle is displayed in the center of the text.



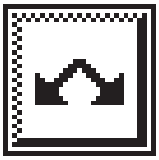
ISO LEFT: Select this to draw text slanted by -30° and positioned at a rotation of 30°. This fits onto the left-hand side of an isometric cube.



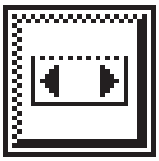
ISO RIGHT: Select this to draw text slanted by 30° and positioned at a rotation of 330°. This fits onto the right-hand side of an isometric cube.



ISO PLAN: Select this to draw text at -30° and positioned at a rotation of 330°. This fits onto the top face of an isometric cube.

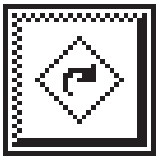


MIRROR TEXT: Select this icon to draw mirrored text. This function reverses values on the X axis, in the same way as the Mirror Y icon described under Drag Insert.



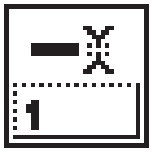
FIT: This allows you to alter the overall width of the text block. Select the Fit icon and plant the cursor. Move the Mouse to the right (or to the left if left justified) to adjust the size of the cursor and then click again to fix the cursor position. Select the **OK** icon to draw the text.

The Fit icon has a value field which allows you to enter a new text width at the keyboard. Select the Fit value field, (opposite the Fit icon), and a window will be displayed. Key in a new value and press **Enter**. To draw the text, just plant the cursor.



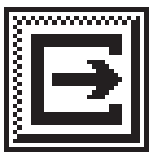
ROTATION: This lets you alter the angle of rotation of the text between -180° and +180°. 0° is the default. Select the Rotate icon and then plant the cursor. Move the mouse to see the rotation and click to fix the text in the new position. To draw the text, select the OK icon.

The Rotation value field lets you type in a new value for rotation. Select the value window and another window will be displayed at the bottom of the screen into which you can enter a value. Click again to draw the text.



WEIGHT: This lets you select a line weight. The line weight palette is displayed. To select a new line weight move the cursor over one of the selections and click the button.

OK: Confirm drawing of text; used by Fit and Rotation.



EXIT: Exit, and remove the palette.

Once the first block of text has been displayed, Accucadd remains in Text mode, retaining the current text in case you want to draw several copies of the same text.

If you press **F3**, you can return to the text to edit it, allowing you to draw a different version without retyping it.

If you have used Form Feed (Ctrl L) characters in the text, Draw: Text automatically advances through the `pieces' of text you entered. Form Feeds are explained fully below.

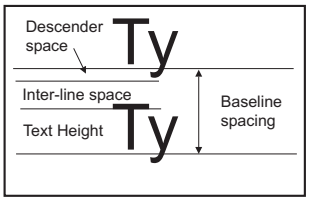
Details: The drawing scale factor is not applied to the text height, line space or text space, so that you can specify the text in terms of its size on a printed version of the drawing on the paper size currently selected (i.e., in `paper' units). If you change the drawing scale factor (e.g., for printing the drawing), the text will change size accordingly.

Accucadd can use "Clockwise from West" or "Anti-clockwise from East" angle conventions, which affect the meaning of the text rotation angle, but not the text slant. "Clockwise from West" is the default convention, and is used in the explanations above. These conventions are explained under `Entry Formats' in Draw: Keyboard Input.

Text entered in a size too small to display as characters is shown as lines on the screen. However, it is still stored as characters in the computer's memory. The minimum size at which text can be printed on paper is 0.7 mm (0.03"). Text smaller than this will be printed as lines. Text displayed on the screen will be drawn as lines if the characters are less than four pixels (screen dots) high. This will depend on the current view (see View functions).

Conventions: It is usually worthwhile to use a separate layer to hold the text in your drawing, so that it can be hidden while developing the drawing (this will speed up work with Accucadd considerably). If your text can be divided up logically (for example, into dimensions, part numbers, company-and-author and comments), it is often useful to use a separate layer for each of these divisions.

Advanced: The following material will allow you to manipulate text heights:



As noted above, the `Text Height' is the (vertical) length of the vertical stroke of a `T', in normal or slanted fonts. The total height of a line of text is made up of three elements: the text height (the height of a capital letter), the space for descenders (e.g., the tail of a `j' or `y'), and the inter-line space. The descender space is $\frac{2}{7}$ of the text height; the default inter-line space is $\frac{4}{10}$ of the text height.

While this produces text that is pleasing to the eye, it isn't very useful for controlling the height of a block of text. For this, we need to set the inter-line spacing to produce the desired baseline to baseline spacing. This is quite simple if we use Accucadd keyboard input formulae:

*line-spacing = base-spacing - (9/7 * text height)*

For example, if you were using 3.5mm text, and wanted to place some lines of text 8mm apart, you would set the text height to 3.5mm, then select the line spacing value and type:

8mm - (9/7*3.5mm) ENTER

Slanted text is created by shearing the normal font, so that the vertical height remains unchanged.

The width of text depends on the proportions of the font; all the monospaced fonts supplied with Accucadd (See Draw: Text Fonts) are the same width.

Ctrl L (Form Feed)

Accucadd assigns a special meaning to the Ctrl-L (Form Feed) character when it is drawing text. When you are drawing text, **Form Feed** (Ctrl-L) characters divide up a piece of text which you have typed and edited as a single piece, but which will form several separate text blocks on the drawing. As an example, consider the following text, where every single Ctrl-L is represented as the two characters **^L** in bold.

Mary**^L**had**^L**a little lamb

Type this into the text editing window, then ***position the cursor at the beginning*** (at the M of Mary). This cursor move is important. Click OK.

You will find that the first piece of text you plant in the drawing is just "Mary," then automatically, Accucadd moves on to "had," then finally to the phrase "a little lamb." It's exactly as if you entered Draw: Text three separate times in succession, typing "Mary" on the first time, "had" on the second, and "a little lamb" on the third. However, it's a lot quicker.

Incremental Labeling, Attributes

When you click **OK** to return from the text editing window to Draw: Text, the first piece of text you draw is the one containing the cursor. When you click the button to draw another piece of text, Accucadd takes the following one, and so on until it reaches the last piece, when it will repeat that piece every time you click.

Automatic Labeling

For example, to use Draw: Text to label a set of components on the current drawing, type the following text into the editor:

Component 1 **^L**
Component 2 **^L**
Component 3 **^L**
Component 4 **^L**
Component 5

Move the cursor back to the start of the buffer and click **OK** to exit from the editor. The first time you click to draw text, "Component 1" is drawn; the second click produces "Component 2". If you select Edit:

Undo, “Component 2” is removed from the drawing, and when you click again at a new position, it will be drawn there.

The text of the label that will be drawn next is shown on the Status Bar.

You can return to the text editor from Draw: Text using the **F3** key; the cursor will then be at “Component 3”. If you move it to “Component 5”, press **Esc** to return to Draw: Text and click to draw text, “Component 5” will be drawn.

Attributes

Attributes for use with RoboDATA, being simply text blocks, can be created in the same way as labels. If you use a standard or near-standard set of attributes in many drawings, you should save them as a file, as described below.

Generating Attributes and Labels

The editor’s Cut and Paste functions are very useful in creating a long series of attributes or labels, provided that they have a common format. For the example above, you could type a single label template, thus:

Component **^L**

Select the text (shift-arrow, or drag the cursor) and copy it to the clipboard by pressing **Ctrl-C** (or Edit: Copy). Position the cursor below the template and press **Ctrl-V** (or click Edit: Paste) several times, to create copies of the template. You can then edit them to create the specific labels.

Saving Attributes and Labels

If you will want to re-use a set of templates, save it as a file. Note that you can pick a set of labels or attributes off a drawing using the Text Editor, then combine them into a single file with careful use of the Cut and Paste functions. You may find it useful to create some general use templates and save them. For example, if you are drawing circuit diagrams, a template for labeling resistors consisting simply of:

R1**^L**
R2**^L**
R3**^L**
...
...
R99**^L**
R100**^L**

can be very useful.

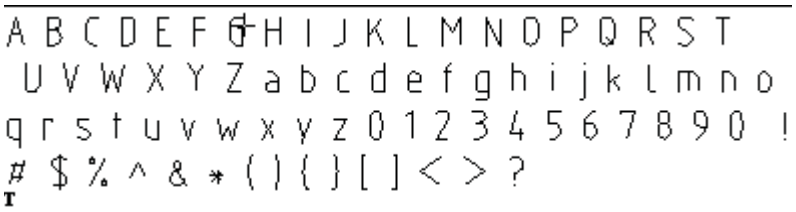
DRAW TEXT FONTS

This section describes the text fonts supplied with Accucadd.

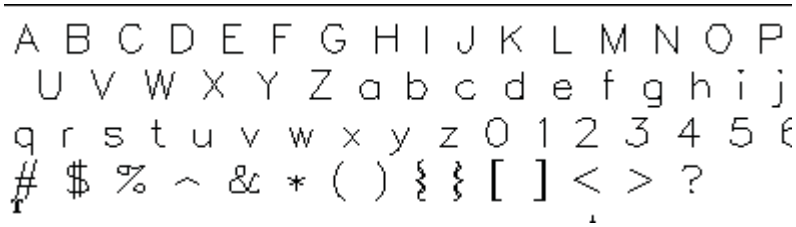
Accucadd is supplied with a total of 27 text fonts. One of them (DIMTERM) is reserved for Accucadd's own use (it's part of Dimensioning). The other 26 can be used for drawing text at any size or in any position. They are selected for use from the Font Catalog, described in Draw: Text. It is possible to install additional fonts; this is described in Appendix C of this manual, "Configuration".

The fonts supplied with Accucadd are shown below, at a constant text height to illustrate their variable widths.

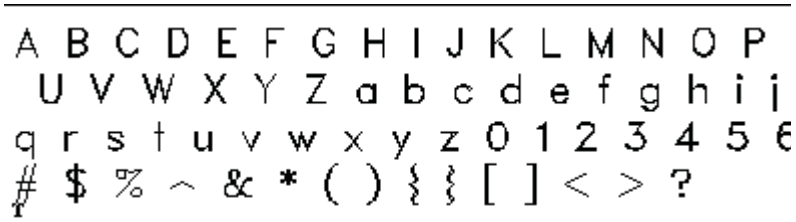
ISONORM
ISO standard font



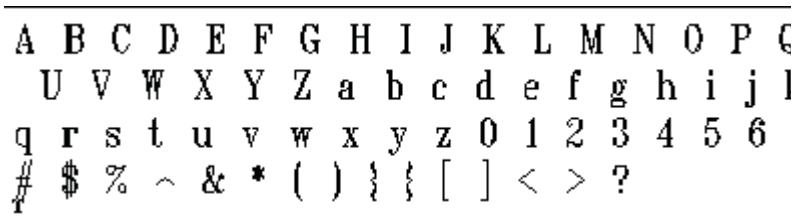
SIMPLEX
MSIMPLEX



DUPLEX
MDUPLEX

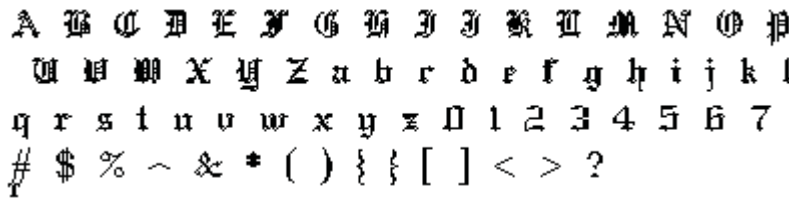


TRIPLEX
MTRIPLEX

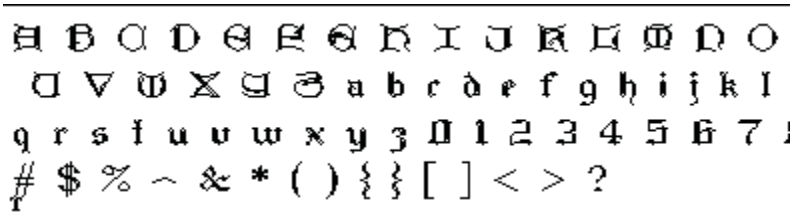


TEXT FONTS DRAW

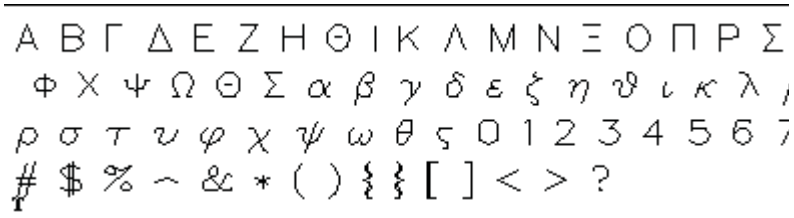
ENGLISH
MENGLISH



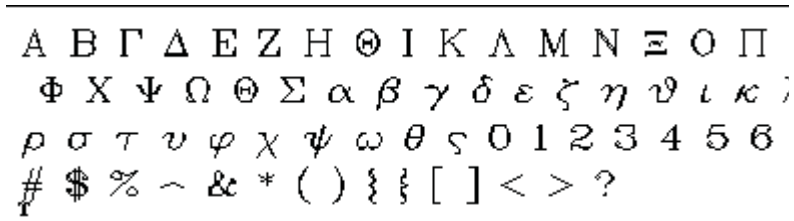
GOTHIC
MGOTHIC



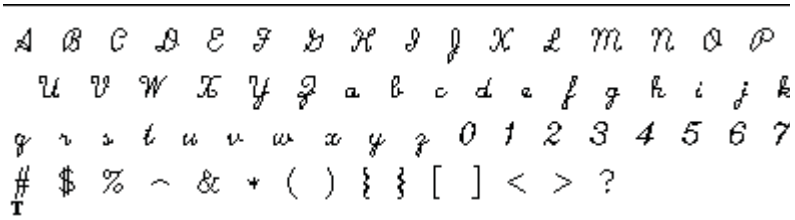
GRKSPX
MGRKSPX
Simple Greek font



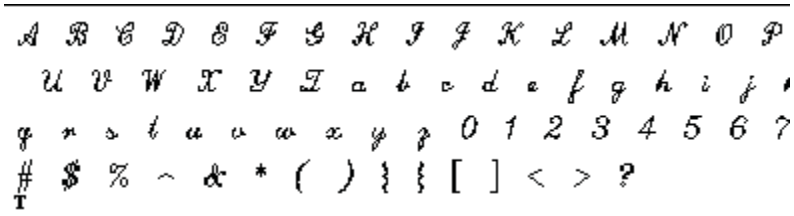
GRKCPX
MGRKCPX
Complex Greek font



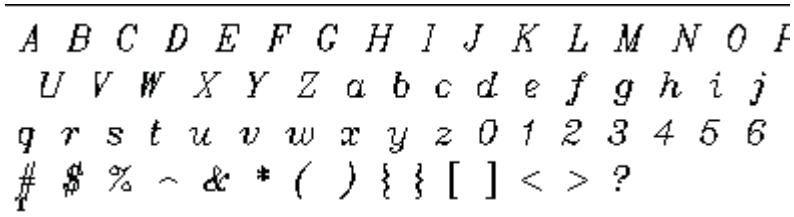
SCRIPT1
MSCRIPT1



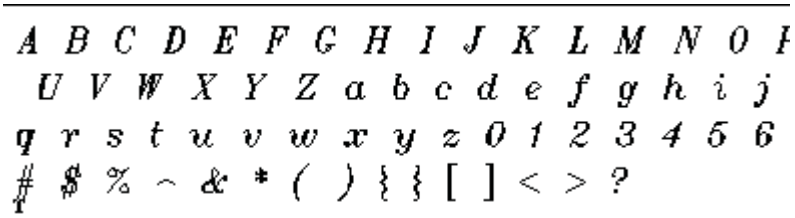
SCRIPT2
MSCRIPT2



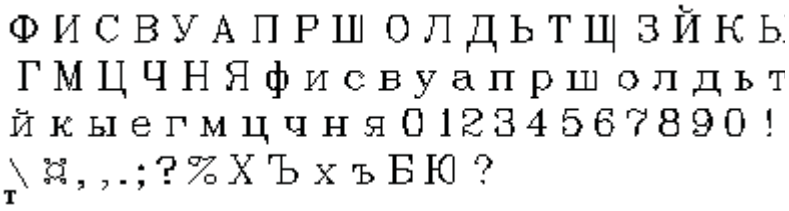
IDUPLEX
MIDUPLEX
Italic DUPLEX



ITRIPLEX
MITRIPLE
Italic TRIPLEX



CYRILLIC



ARCH1

HEBTEXT

Note: the HEBTEXT characters shown above are characters 128 through 154. The remaining characters in the HEBTEXT font are based on the ISONORM font. To type characters not on the “normal” keyboard use the Alt key numeric pad sequences, i.e. To type character 128 press and hold Alt, type 128 ***on the numeric keypad***, then release Alt. If your keyboard does not have a numeric keypad (older models, some portable and laptop machines) consult your computer documentation.

Monospaced Fonts

The monospaced fonts are identical with the corresponding proportionally spaced fonts as far as the character forms are concerned. However, all monospaced font characters have the same width–an upper case W in that font. This means that columns of monospaced characters will line up vertically–which is not true of proportional fonts.

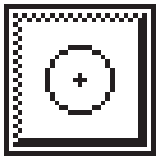
MSIMPLEX is the monospaced version of SIMPLEX; MITRIPLE is the monospaced version of ITRIPLEX, and so on. To save space the monospaced fonts are not separately illustrated.

DIMTERM This font is used to provide the Accucadd Dimension terminators. It contains only the characters used for that purpose and isn't useful for drawing general text. You can draw its characters with Dimension: Arrow; the font is described in Dimension: Terminators.

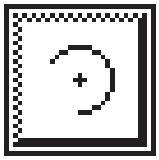
Other Fonts If you want to modify the Accucadd fonts, Accufont forms part of the Accucadd Utilities package. This enables you to modify existing fonts and create new ones.

This function draws circles or arcs tangent to lines and/or points.

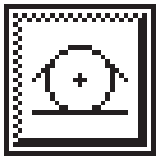
The TAN CIRCLE palette is displayed:



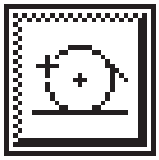
CIRCLE: Draw a complete circle.



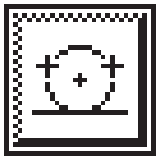
ARC: Draw an arc through the tangent points — the arc can be chosen from the three possibilities, as described below.



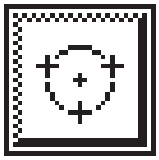
THREE ELEMENTS: Select this icon to define the arc/circle by selecting three elements from the drawing.



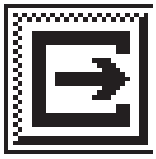
TWO ELEMENTS: Select this icon to define the arc/circle with one point (indicated with the cursor) and two elements.



ONE ELEMENT: Select this icon to define the arc/circle with two points and one element.



THREE POINTS: Select this icon to define the arc/circle with three points.



EXIT: Leave TAN CIRCLE.

Firstly, select the type of arc/circle definition you want to use. When learning to use this function, start with Three Elements; it is the most obvious.

Next, position any points required using the cursor — the full range or Toolkit drawing aids and keyboard input facilities can be used. Then, select the elements (lines, arcs and/or circles) that the new arc or circle is to be a tangent to. The order you select them in doesn't matter.

A circle is shown, tangent to the points and elements you have chosen. If more than one circle can form a tangent to these items, move

the cursor to select the one you require, then click the button to confirm.

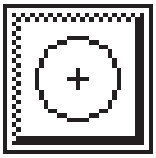
If you have selected Circle, the circle is drawn. If you have selected Arc, one of the possible arcs is displayed. Move the cursor to select the arc you want, and then click to draw the arc.

Details: If a circle can't be made tangent to the elements and/or points you've selected, the warning "No touching circle" is produced.

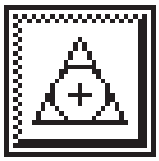
DRAW POLYGON

This function draws regular polygons.

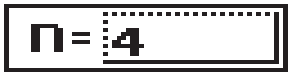
The Polygon palette is displayed, together with the line style and line weight palettes. These control the lines that make up the polygon; the Polygon palette itself has the following icons:



CIRCUMSCRIBED: Select this icon to define the size and orientation of the polygon by means of its circumscribed circle — the circle touching (through) its corners. The orientation will be set by positioning a corner (vertex) of the polygon.



INSCRIBED: Select this icon to define the size and orientation of the polygon by means of its inscribed circle — the circle tangent to its sides. The orientation will be set by positioning the mid-point of a side of the polygon.



SIDES: Select this icon to enter the number of sides for the polygon. Changing the number of sides does not reset the size or orientation of the polygon, which can be useful in constructing polygons at odd orientations. The maximum number of sides is 999, but more than 30 sides are rarely useful.

Select Circumscribed or Inscribed, then position the cursor at the center of your intended polygon and click the button. A circle is drawn, with the cursor at its edge. Position the cursor so as to set the radius and orientation, then click the button to draw the first polygon.

The cursor then changes to a circle, which you can use to draw further polygons at the same size and orientation. Position their centers and click the button.

To reset the size and orientation, press **Esc**, or select Circumscribed or Inscribed. Press **Esc** again to leave Draw: Polygon.

Details: A polygon is created as a series of line Entities, and can be edited just as if all the lines had been drawn individually. To get rid of an unwanted polygon, use Edit: Undo immediately.

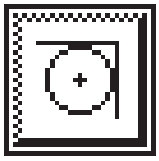
Warning: Polygons with several hundred sides use up a great deal of New Data memory!

FILLET DRAW

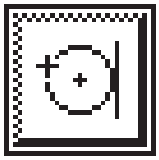
This function creates fillet arcs between lines, circles and/or arcs and points.

The Fillet palette is displayed, together with the line style and line weight palettes. The Fillet palette shows:

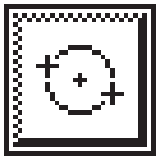
RADIUS: The fillet radius. To set the radius, position the cursor over the box and click the button. Type the new radius into the input window and press **Enter**.



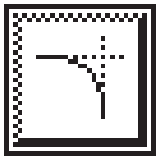
LINE-LINE: The Select Item cursor is presented; select two lines, arcs or circles, or a combination, by positioning the cursor over each element and clicking the button.



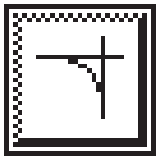
POINT-LINE: Position the cursor at a point and click, then select a line, arc or circle using the Select Item cursor.



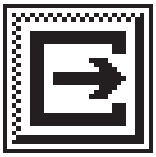
POINT-POINT: Select two points through which the fillet will pass, by positioning the cursor and clicking.



AUTO TRIM: If you select this icon, the elements being filleted are automatically trimmed to the fillet arc. If they do not touch it, they are extended to meet it.



NO TRIM: If you select this icon, the elements being filleted are not altered. You can remove them later with Edit: Erase.



EXIT: Select this icon to leave Fillet.

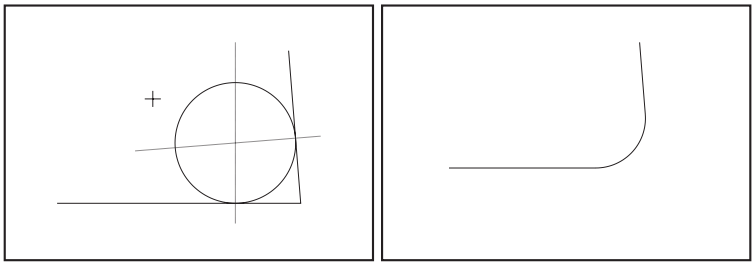
When you have selected your points and/or Entities, Accucadd calculates the possible fillet positions and draws one of them as a circle on the drawing. If there are no possible fillets (e.g., you selected two parallel lines, too far apart to span with the fillet radius), a warning: “Invalid fillet” is displayed.

Filleting

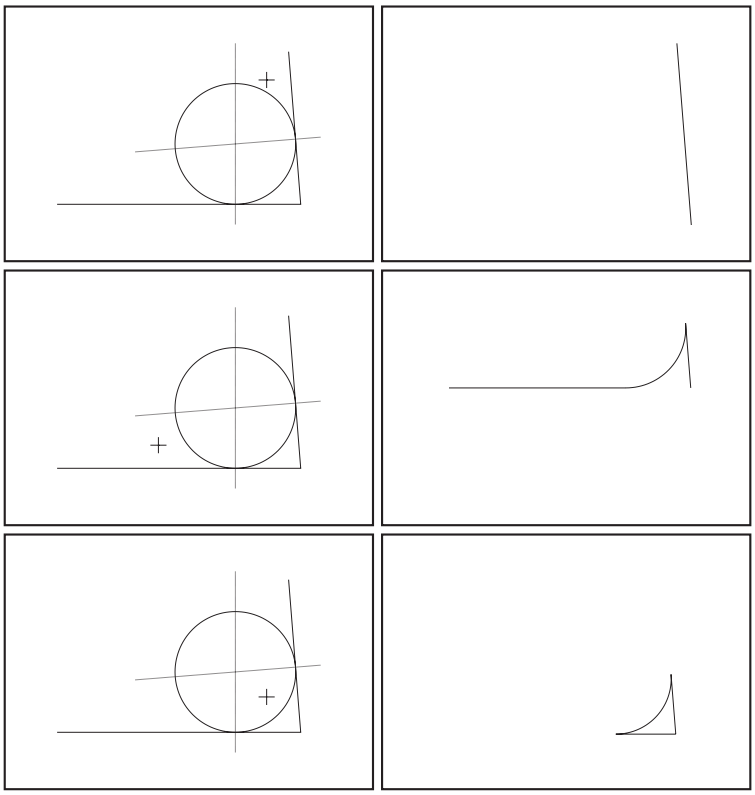
Where fillets are available, Accucadd displays a circle corresponding to one of them, together with one or two construction lines and a cross-shaped cursor with which you can position the fillet. As you move the cursor the fillet circle moves to illustrate the fillet at the chosen point.

Positioning the cursor within the construction lines selects the parts of the lines being filleted to be removed — examples are given below. Click the button to confirm your selection. Accucadd draws a fillet arc at the chosen location, and adjusts the selected elements if Auto Trim is selected.

LINE-LINE filleting presents the most complex selection examples; to draw a conventional fillet, position the cursor as shown below:



Lines `opposite' the cursor are removed, as shown here:



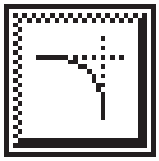
CHAMFER DRAW

This function chamfers corners between straight lines.

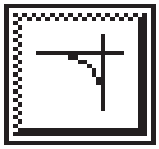
This function is very similar to DRAW: FILLET, and is used in the same way. It can be though of as “Filleting with a straight line”. Note that it is only usable on straight lines. It produces the same result as you would get if you filletted the two lines with the specified filet radius, and then drew the chord, not the arc.

The Chamfer palette is displayed, together with the line style and line weight palettes. The Chamfer palette shows:

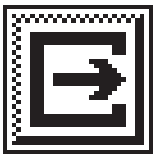
RADIUS: The ‘generating fillet’ radius. This is used to calculate the position of the chamfer line, as shown below. To set it, position the cursor over the box, click the button, type the new radius and press **Enter**.



AUTO TRIM: If you select this icon, the elements being chamfered are automatically trimmed to the chamfer line. If they do not touch it, they are extended to meet it.



NO TRIM: If you select this icon, the elements being chamfered are not altered. You can remove them later with Edit: Erase.



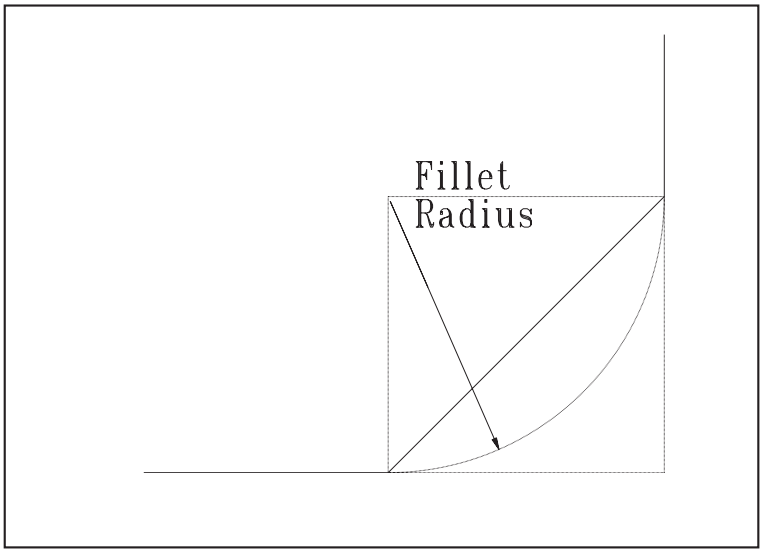
EXIT: Select this icon to leave Chamfer.

The Select Item cursor is presented; select two lines by positioning the cursor over each line and clicking the button.

Accucadd then calculates the possible chamfer positions and draws one of them as a pair of lines on the drawing. If there are no possible chamfer positions (for example, the lines are parallel) the warning “Invalid fillet” is displayed.

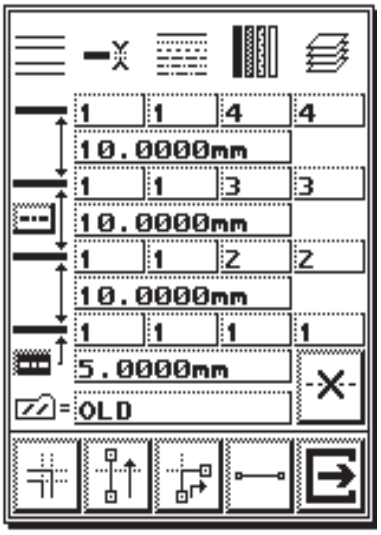
Where chamfering is possible, Accucadd displays a pair of lines corresponding to one of the possible chamfer lines, together with a cross-shaped cursor with which you can position the chamfer, in the same way as a fillet. As you move the cursor the chamfer lines move to illustrate the chamfer at the chosen point. Click the button to confirm your selection. The program draws the chamfer line in the chosen location, and adjusts the selected elements if Auto Trim is selected.

Details: The fillet radius is used to calculate the chamfer position thus:



PARALLEL DRAW

This function draws up to four sets of lines parallel to straight lines, curves, circles and arcs. For simplicity, all four are referred to as lines below. The original line(s) chosen is/are called the Key Line.



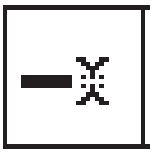
You will operate Parallel by selecting a “key line” or guide line from the drawing. The key line can be one line, or several joined or intersecting lines. Parallel lines will be drawn parallel to this line. Using the Path options, a parallel can be drawn to a series of lines in one operation; the Join option will miter them neatly. Selecting Delete Keyline will remove the key line automatically.

Up to four parallel lines can be drawn, centered on the key line or placed to either side of it. The lines are numbered 1-4, running *up* the palette — Line 1 is at the bottom, and line 4 at the top.

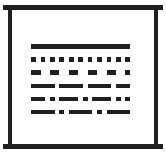
The layers, line styles, line weights and colors of the parallel lines can be set individually, if required.

Line attribute control

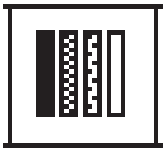
Accucadd will draw up to four parallel lines. Each line has a row of windows on the palette, with an icon at the head of each column. The following attributes can be selected for each line:



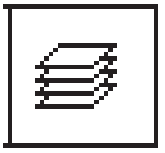
LINE WEIGHT: Select the window compartment corresponding to this icon to change the line weight. On selection, a window is displayed for you to choose a line weight.



LINE STYLE: Select the window compartment corresponding to this icon to change the line style. A window is displayed for you to select a line style.



COLOR: Select the window compartment corresponding to this icon to change the color of the parallel Entities. The color selection window is displayed, and you can select a new color.



LAYER and NUMBER OF PARALLEL LINES: Select the window compartment corresponding to this icon to change, activate or deactivate the layer to be used for a parallel line. The values in these compartments determine which lines are active. On selecting a layer window, Accucadd produces the Layer Status Bar, showing the settings for the current layer of the parallel line, and prompts you to enter a new layer for it. To turn a particular parallel line off select its layer window and then type **N** (for No Layer) followed by **Enter**. See Draw: Elements for a description of drawing on “no layer”.

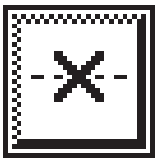
SPACING: Select the value windows that lie between the rows of line setting windows to determine the spaces between parallel lines. A prompt window is displayed at the bottom of the screen. Key in a new value and press **Enter**. You can set spacing for all lines. The effects of spacing are explained below.

CENTER (Note double headed arrow): Select this Icon to center the parallel lines pattern about the key line. The lowest Space window (the `First Line Space' window) is not used when this Icon is selected.

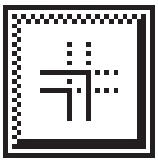
FIRST LINE (Note single arrow): Select this icon to place all the parallel lines to one side of the key line. The First Line Space window is used to determine the stand-off between the key line and the first parallel line.

STYLE: Select this icon to save or a load a Accucadd parallel line style. A window will be displayed giving the option to save or load a line style. Select SAVE and you will be prompted for a style name. Type in a suitable name and press **Enter**.

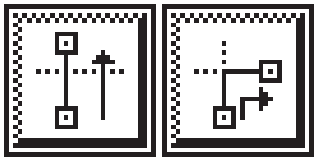
Select Load to load an existing style. You will be prompted for a style name. Type in a suitable name and press **Enter**, or select a style name from the Catalog. You can save any configuration of icon settings as a parallel line style. One pre-defined style, named Accucadd, is supplied.



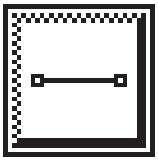
DELETE KEYLINE: Select this icon to delete the key line when you draw the parallel lines. Do this when you want one of the parallel lines to replace the key line. You can retrieve the key line and delete the parallel lines by selecting Edit: Undo after you have Exited from Parallel.



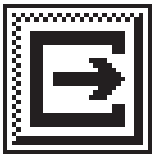
JOIN: Select this icon to "miter" a series of parallel lines drawn with either PATH option (see below). Without this, the parallel lines will overlap at interior corners, and fail to meet at exterior corners. Edit: Break/Extend can be used to tidy up.



PATH Icons: Select one of these icons to draw a parallel line to a series of connected lines in one operation. The two options use different rules for tracing a path across the drawing — see "Using Paths", below, for details.



INDIVIDUAL: Select this icon to turn off either Path icon and return to selecting key lines individually.



EXIT: Select this icon to exit Parallel when you have finished. If you want to cancel Parallel and return to the drawing as it was previously, then select this icon before you select an orientation for the lines, or select Edit: Undo.

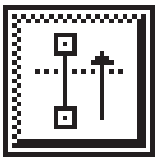
Using PARALLEL

To draw parallel lines, make the required settings for spacing and line attributes on the palette, then select the line (or arc, or circle) that you wish to use as the key line.

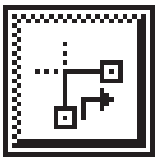
The prompt changes to `Select orientation': position the cursor to one side of the line and click the button.

Using PATHs

When using the Path icons, you are prompted to "select the last key line". Select another line; Accucadd will attempt to trace a path from the first to the last key line, and will draw a parallel to that path. The two Path icons have different rules for generating their paths:



WHOLE ELEMENT PATH: This will join straight lines and arcs, end-to-end. It ignores intersections. The elements comprising the path must join one another (like a Hatch boundary).



PART ELEMENT PATH: This will use parts or all of line and arcs, and parts of circles. It `jumps' from one element to another at intersections and end-points, but won't `jump' across gaps. The elements comprising the path must either join one another or intersect.

Drawing lines

When you have selected the key line(s) and orientation, the parallel lines are drawn. The selected orientation determines *where* they are drawn:

Orientation

The orientation of parallel lines is set by the cursor position; which side of the key line the cursor is on is what matters. Line 4 is always drawn closest to the cursor and line 1 furthest from it, in either Parallel mode.

When using Path options, the position of the cursor also indicates which direction the Path should travel in, if it has a choice. You should experiment with this–it is much easier to see Path in action than to read a description.

FIRST LINE

Here, line 1 is separated from the key line by the First Line Space and the rest of the lines are drawn in order going away from the key line towards the cursor position.

CENTER

Here, the First Line Space is irrelevent. Lines 2 and 3 are placed on either side of the key line, with it centered between them. The space

between lines 2 and 3 is therefore twice the key line to line 2 (or line 3) spacing. Lines 1 and 4 are further from the key line, as determined by the line 1 to line 2 space and the line 3 to line 4 space. Line 4 is on the same side of the key line as the cursor position.

Curves

PARALLEL can draw parallels to Accucadd Curve entities (fitted curves, drawn with Draw: Curves). The Path icons can't be used with Curves. The Curve Step used to make the parallel Curve depends on the Curve Step of the original Curve; sometimes Accucadd has to increase the Curve Step to get a good parallel. Drawing the original Curves with a high Curve Step value usually produces better results.

Special cases:

Either Path option attempts to trace a "sensible"path from the first to the last key line. If it can't find a clear path to the last key line, it will draw parallels to any part that it has found. Only Entities from visible Layers are considered in creating a path.

If there is a `loose end hanging' from a path, either Path option will go along the line, round its endpoint, and back again. If you have drawn a line twice, so that two line Entities are superimposed, the Path options will make use of them individually.

If you choose the same Entity as the first and last key lines, Accucadd assumes that the path isn't to be limited by an endpoint, and will create the longest path it can find. Note that a path will never branch. Whole Element Path will create a path, or draw parallels, that cross the keyline. Part Element Path won't do this; it is limited by the keyline.

When using Path and Join on tight interior corners, Accucadd will sometimes have to dispense with some of the parallel lines. If this doesn't produce the correct result, remove the parallels with Edit: Undo, then try again, exchanging the first and last key lines so as to form the path in the opposite direction. If this doesn't work, draw a "bridging" line, then remove it after creating the parallels. When Joining to parallel arcs, Accucadd sometimes has to add an additional arc to get a correct joint.

EDIT & DIMENSION PATHs

Path selection is slightly different when used from the Group or Dimension palettes:

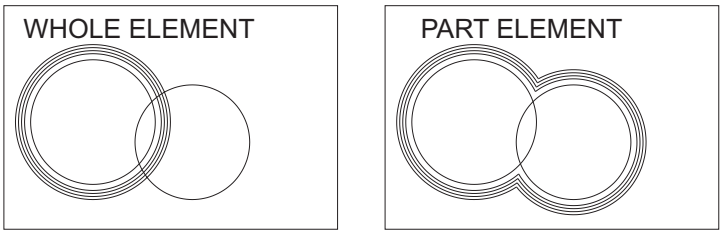
Part Element Path won't go along and round the ends of `loose ends' — it just ignores them.

Dimension Entities that dimension Entities `on' a path are selected as part of the path. Obviously, this isn't sensible when Path is being used with Draw: Parallel.

Examples:

These two drawings show the difference between Whole Element Path and Part Element Path, using the First Line option and orienta-

tion point outside the left-hand circle. Both examples selected the left-hand circle as the first and last key lines.



Warnings: If you draw a parallel line on top of a key line, in effect replacing your key line, you will be unable to select the key line again because there are now two elements occupying the same position. In this situation, use Edit: Undo to remove the parallel lines, and use Delete Keyline before you select the orientation for a new set of lines. The new parallel line will replace the old key line, and you will be able to use it as a key line for more parallel lines.

Edit: Cleanup: Purge will also remove duplicate (superimposed) lines, arcs and circles from your drawing.

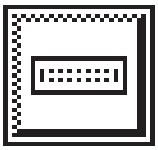
DRAW TEXT BALLOON

This function allows you to place rectangular, circular, or rounded end balloons (boxes, callouts) around text.

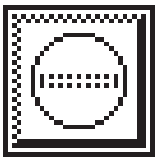
When you select Draw: Balloon the Balloon palette is displayed along with the line style and line weight palettes, and the Whole Item selection cursor. The handles of all the pieces of text on the screen are displayed.

FIX: This icon is used to fix the size of the balloon before selecting the text it goes round; select the Fix icon to lock the balloon at the size shown next to Fix. A balloon cursor then appears, with the Whole Item cursor at its center. Select a text handle to balloon its text

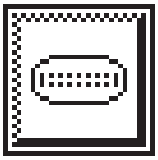
BALLOON SIZE: The `size ' of the balloon; the amount by which it is larger than the text it was planted around, rather than an absolute size. The size is set when you plant a balloon without Fix, so you can set a balloon round one piece of text by eye, then use Fix to fix the size to that it can be used to balloon other pieces of text. This lets you use the same size setting on different pieces of text while producing a consistent appearance.



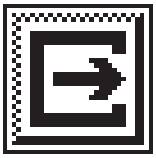
RECTANGLE: Select this icon to use rectangular balloons. Position the cursor over the text handle and click to select the text to be ballooned, then set the size of the rectangle by moving the cursor. Click to place the balloon in your drawing. If you select the wrong text handle, press **Esc** to release it.



CIRCLE: Select this icon for circular balloons. Select the text handle and adjust the size of the circle as for Rectangle. You can set the line style and weight for all the balloons using their palettes.



ROUNDED END: Select this icon for rounded end balloons. Select the text handle and adjust the size and shape of the box as for Rectangle.



EXIT: Select this icon to leave DRAW: BALLOONS.

Details: BALLOONS are automatically aligned to the base line of the text; when you select a text handle without Fix, the balloon cursor is shown at the same angle as the text. If you use Fix, the balloon cursor will be displayed at a fixed angle. When you plant a Balloon on angled text, it will be rotated to match the text.

To Balloon the text of a dimension, Explode the dimension.

Conventions: If you Hatch your Balloon we recommend you make the Hatch color contrast with the text color.

Warnings: When you Hatch a balloon, do not place the Hatch origin inside the text box. If you do, you will hatch the text, rather than the balloon. The warning palette is produced when you do this, with the message `Hatch origin on text box'.

Advanced: Rectangle and Rounded End Balloons are constructed from basic Entities (see Summary: Entities). Rectangle is composed of four line Entities; see Edit for information on editing Elements. Rounded End is made up of two line Entities and two arc Entities which form the rounded ends of the shape. The Circle balloon is a single Entity in its own right, of course.

This function lets you select any part of your drawing and copy it to any part of the current drawing or on to another page. The copies can be transformed or have their drawing attributes changed, and several copies can be created one after the other.

When you select Draw: Copy the Group palette is presented. This is described under Edit: Group; use it to select Entities from the drawing for copying. *If you want `magnetic' snap points to appear on new copies of Entities, turn on Toolkit: Points: Edit Create.*

When you select **OK** from the Group palette, the Copy window is displayed. Position the cursor over the window and click to select one of the following functions:

Drag — Select this to position the copy anywhere on the current drawing, another page, or the Scratchpad. Accucadd presents you with an image which you can pick up and position anywhere. You can also use all of the transformations associated with Drag Insert, including Cutout. The Page palette is also produced, so that you can place the copy on another page (see Set Up: Page).

Frame — Select this to transform the copy before you position it. When you select this function one of two palettes is displayed. If you are copying an Insert the Frame Insert palette is displayed. If you are Copying any other drawing Entities, a smaller palette which contains a subset of the icons in the Frame palette is displayed. In either case, you can use Cutout to clear the space where the copy is placed.

You can alter all of the copy's attributes before planting it, (See Frame Insert). As with Drag, you can place the copy on another drawing page.

Mirror — Select this to form a single copy of the selected data, reflected about any axis. A line cursor is provided: draw the line about which the original is reflected to form the copy. Note that this function doesn't create mirror-images of text.

Offset — Select this to position the copy anywhere on the current page. A line cursor is provided: draw a line whose length and direction indicate the displacement and direction of the copy from the original.

Square Repeat — Select this to position the copies at regular points on a rectangular grid. When you select this function a window is displayed which prompts you to enter the number of columns. This is the number of copies you want to be drawn horizontally across the page. Key in a number and press **Enter**. You are then prompted for the `Column space from (the) origin'. This is the horizontal distance between the

center point of the copy and the first column. All subsequent columns will be offset from each other by this distance.

You can use the cursor to determine the offset. To do this, plant the start point or the line cursor, then move away to plant the end point. This allows you to offset from any point on the screen. Alternatively you can key a value into the window at the bottom of the screen. Key in a negative number if you want the copies to be drawn to the left of the original. Key in a positive number if you want the copies to be drawn to the right of the original.

Accucadd prompts you for the number of rows of copies. Key in a number and press **Enter**. It then prompts for the `Row space from the origin'. This is the vertical distance of the first row from the origin; subsequent rows will be offset by this distance. Key in a negative number if you want the copies to be drawn below the origin, or a positive number for copies above the origin. Alternatively, use the cursor as for `Column space from origin'.

The copies are now drawn, from bottom to top if you have a positive row space, or vice versa if you have a negative value. Note that the original item(s) selected are included in the grid of copies.

Radial Repeat

Select this to draw copies radially at equal divisions. When you select this function the first prompt asks if the group is to be rotated. The center point of the group is then asked for and only if the group is not to be rotated is the center of orientation requested.

Next you are prompted to enter the number of copies. This is litteral: it's the number of copies, not including the original. Key a value into the window provided and press **Enter**. You will then be prompted for the total angle of the circle around which you want to draw the copies. Again, this is litteral and does not include the original. This can be any angle you wish up to 360^{o}.

Key in a positive value to draw copies to the right of the original or a negative value to draw copies to the left. If you have an original, and you want eleven copies (imagine a clock face) then you want the copies spread over 11/12 of the clock face. You can use Accucadd's formula entry to make this easy: simply type 360 * 11 / 12 for the angle. (In this case, however, there's a special solution available).

A special case

If the total angle you require is 360^{o}, simply press **Enter**. This will enter a value of 360^{o} and the last copy, which would be placed on top of the source data, is not planted. *Do not type the value 360^{o} and press **Enter*** as this will force the last copy to be planted on top of the source data, duplicating it. Key in a positive value to draw copies to the right of the original (clockwise) or a negative value to draw copies to the left (counter-clockwise).

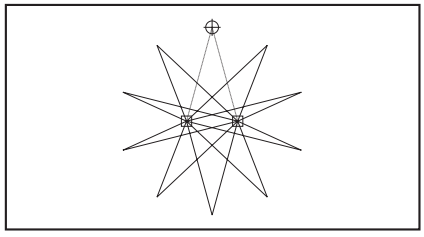
Details: When you copy an Entity, Insert, text block, or group of Entities, all layers are switched off. To plant the copy on a specific layer, select trhat layer from the Status Bar before the final Copy step is taken. To plant the components of the copy on their original layers, plant the copy before activating a layer. If you do not specify a layer, when you come to use an Edit function, the Handle of your insert will still be visible even if the layer it is on has been switched off. This insert will therefore still be subject to Edit functions such as Move, Erase etc. See Edit.

STRETCH-COPY DRAW

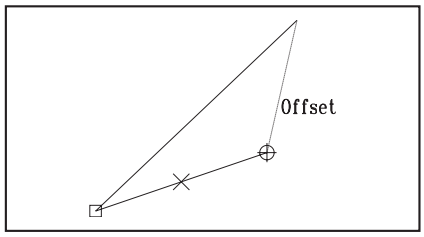
This function allows you to copy Entities or parts of Entities to a different position on the drawing. Unlike Draw: Copy, Lines, Arcs, Nibs, Hatches, Curves and Dimensions can be stretched by the movement, instead of simply moving with it. Please study Draw: Copy and Edit: Group before attempting to use Stretch-Copy.

Principles: Unlike most Accucadd functions, Stretch-Copy does not work with Entities directly. Instead, it selects Move Points — positions in the drawing — and then selects the Entities that have an endpoint there. It allows you to copy the selected Move Points; the selected Entities are *stretched* to accommodate the new position of the Move Points while keeping their other endpoints in their former positions. The Square Repeat and Radial Repeat options allow multiple copies to be made of the Move Points and thereby of the Entities attached to them.

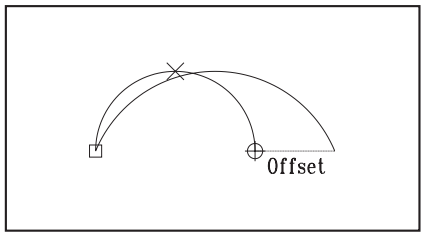
Selection is done with the Group palette, described under Edit: Group. Lines, arcs and circles can be part-selected, and will stretch or move from the point at which they are subdivided (their "Pivot Points"). Move Points are shown as a small circle with a cross-hair; Pivot Points and ordinary Endpoints are shown with a small box, as usual. Use of the Show Markers icon is recommended with Stretch-Copy.



A single copy of the selected Entities can be made, at a position indicated with a line cursor, or multiple copies can be made in square arrays or radial rings. These options work in the same way as the Offset, Square Repeat and Radial Repeat options of Draw: Copy (q.v.). The example on the left shows the use of Radial Repeat with Stretch-Copy to good effect.

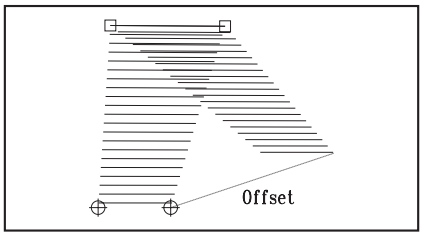


A line with one endpoint selected as a Move Point stretches when it is copied. If both endpoints are Move points, it will be copied without being otherwise altered; if neither is, it won't be copied.



A copied arc will maintain its chord height ("Sagitta") as it stretches, altering its radius and center position to accommodate the new endpoints. If both endpoints are Move points, a simple copy will be made; if neither is, it won't be copied.

STRETCH-COPY DRAW



A copied nib will be stretched if one to three of its corners are Move Points; if all are, a simple copy will be made at the new Move Point positions.

Other Entity types:

Copied Dimensions stretch in much the same way as lines; their text adjusts automatically for the new positions of Move Points. If a Dimension text handle is a Move Point, the text is copied separately from the Dimension.

Hatches will stretch if their seed point is selected as a Move point and at least one of their corners is not. If all points are selected, they are simply copied. However, if the seed isn't selected, there is no effect. Stretch-Copy isn't vary useful with hatches, as the copied hatched area usually overlaps the original.

Copied Curves will stretch, in that one or more of the lines that they consist of will be stretched. The original form of the curve is not maintained. Examples of stretching Curve and Hatch Entities are shown under Edit: Stretch-Move.

No other types of Entity will stretch. If they are selected, they will be copied; select them in the normal way, as described under Edit: Group.

When selected, Stretch-Copy displays a window for selection of Offset, Square Repeat or Radial Repeat copying. These work in the same way as Draw: Copy, and are described there. When learning to use Stretch-Copy, stick to Offset until you are confident.

Once you have selected the type of copying, Accucadd presents the Group palette. Selection with Group for Stretch-Copy is a little different from normal Group selection: read the descriptions below carefully.

WHOLE ITEM

Position the cursor over an endpoint and click the button; the endpoint is marked as a Move Point and all Entities with an endpoint, corner, handle or center there are selected for moving. Lines, arcs and nibs which are selected and don't have all their endpoints as Move Points will be Stretched.

You can also select and de-select entire Entities, in the normal Group style for Whole Item. This is useful to de-select stretchable Entities, and to select non-stretchable ones (e.g., Text) for moving. Note that a stretchable Entity won't be altered unless it has a Move Point, and can only be moved as a whole if all its endpoints are Move Points (use Whole Box for this)

PART ITEM — Select in the same way as Whole Item. Lines and arcs that are selected will be subdivided if any intersect any other line or arcs; the intersection point becomes a Pivot Point and is treated as the endpoint of the Element.

WHOLE BOX, WHOLE FENCE, WHOLE ELEMENT PATH, PART ELEMENT PATH — Use the cursor as described under Edit: Group. All endpoints selected become Move Points; Entities will be selected if their endpoints or Handles lie within the box. All Entities selected will be Moved, including Entities that extend outside the box. Lines, arcs and nibs which have endpoints that haven't been selected will be Stretched.

CUT BOX, CUT FENCE — Nibs stretch in the same way as Whole Box. Lines and arcs will be subdivided at the box edge; Pivot Points are placed there and act in the same way as for Part Item. Inserts can be exploded in the usual way, as described under Edit: Group.

Making copies — When you select **OK**, the Group palette is removed. The parameters for the copying option you have selected are then requested: an offset for Offset mode, the number of rows and columns and their spacing for Square Repeat, and so on. Enter these as described under Draw: Copy. When you have finished, the copy or copies are made and Stretch-Copy terminates. Select another function to continue using Accucadd.

Details: — If you select a point a second time, it toggles between being an endpoint and a Move point. If an Entity is selected twice, it is de-selected. If, for example, you wished to stretch a Nib, and selected two of its corners with separate Whole Item selections, you would have selected the Nib Entity twice, and therefore deselected it. You would have to select one of the Move points again to select the Nib as an Entity to be moved and stretched.

Layers — When the status bar displays layer "OFF", you can select it and enter a new layer number to force the copied Entities onto that layer. If you leave it at "OFF", they will remain on their original Layers.