PICTeX command summary

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22nd January 1990

This article contains a summary of the PICTeX commands. This is intended as a reminder for users who have read the PICTeX manual (which is available from the LFCS library). The following conventions should be observed when using PICTeX commands:

- At least one blank must be present for each blank in the command prototypes below.
- Quantities in <>'s must be specified as explicit dimensions, or in terms of TeX's dimension registers.
- *coord*, *xcoord*, *ycoord*, *x*, and *y*, with or without subscripts or superscripts denote coordinates with respect to the current coordinate system. In particular, they are dimensionless quantities. Values must be expressed in fixed point notation, with at most 5 digits to the right of the decimal point.
- Parts of a command enclosed in [ ]'s may be omitted.

1 Commands

The PICTeX drawing commands are:

`\accountingoff`
`\accountingon`

These commands suspend and resume PICTeX's updating procedure for the minimum size box enclosing the picture. They should only be used when PICTeX has been notified of the minimum size box already (e.g. by executing a `\setplotarea`).

`\arrow <`ℓ`> [`β`,`γ`] [<`*xshift*`,`*yshift*`>] from` $xcoord_s$ $ycoord_s$ `to` $xcoord_e$ $ycoord_e$

This command draws an arrow, where ($xcoord_s$,$ycoord_s$) is the start of the line on which the arrow lies, ($xcoord_e$,$ycoord_e$) is the end of the line on which the arrow lies, ℓ is the length of the arrowhead, $\beta\ell$ is the width of the arrowhead at half its length, and $\gamma\ell$ is the width of the arrowhead at its full length. The arrowhead will be open, and will be drawn with a smooth curve through the width points and the end of the line. The arrowhead will curve in if $2\beta < \gamma$, and curve out if $2\beta > \gamma$. `<`*xshift*`,`*yshift*`>` has the same effect as in the `\put` command.

```
\axis [bottom] [top] [left] [right]
  [shiftedto y=ycoord] [shiftedto x=xcoord]
  [visible] [invisible]
  [label {axis label}]
  [ticks]
    [out] [in]
    [long] [short] [length <length>]
    [width <width>]
    [butnotacross] [andacross]
    [unlabeled] [numbered] [withvalues value_1 value_2 ... /]
    [unlogged] [logged]
    [quantity q] [from coord_s to coord_e by dcoord]
      [at coord_1 coord_2 ... /]
  /
```

This command draws an axis along the `bottom`, `top`, `left`, or `right` edge of the current plot area (one of these keywords must be specified). The `shiftedto` option causes a bottom or top axis to be drawn at the specified y-coordinate, and a left or right axis to be drawn at the specified x-coordinate. The keyword `invisible` suppresses the drawing of the axis, but not of tick marks, labels, etc. `visible` is the default. The text specified by *axis label* is centred with respect to the appropriate edge of the plot area. `ticks` causes tick marks to be drawn on the axis:

- Ticks normally point `out` from the plot area; `in` makes them point into the plot area.
- Ticks are normally `long`, but can be made `short`, or given an arbitrary *length* with the `length` option.
- The *width* of the ticks can be set with the `width` option.
- Ticks can be extended across the whole plot area with the `andacross` option, making grid lines. The default is `butnotacross`, which stops the ticks from extending across the plot area.
- Ticks are normally `unlabeled`. If the `numbered` option is used, the `at` or `from` options below assign numeric values to them. Arbitrary tick labels can be specified by the `withvalues` option; the labels *value*$_1$, *value*$_2$, ... are assigned to subsequent ticks until the list of values is exhausted or an `unlabeled` or `numbered` keyword is encountered. Values must be separated by at least one blank, and at least one blank must precede the '`/`' that terminates the list. If a value contains a blank or '`/`', enclose the entire value in {}'s.
- The option `quantity` q draws q ticks equally spaced from left to right, or from bottom to top. The first and last ticks are at the ends of the axis.
- The `from` option draws ticks at the indicated coordinates. *coord*$_s$, *coord*$_e$, and *dcoord* must be fixed point numbers, with the same number of digits to the right of the decimal point (if any), and *dcoord* must be positive. If the `numbered` option is in effect, the coordinate of the tick is used as the tick label.
- The `at` option draws ticks at the specified coordinates. As with the `from` option, the coordinates must be fixed point numbers, which are used as tick labels if `numbered` is in effect. The list of coordinates must be terminated by '`/`'.
- The `logged` option applies only to the positioning subsequent ticks specified by the `at` or `from` options. Ticks are placed at the $\log_{10}$'s of the specified locations; the original unlogged numbers are used as labels if `numbered` is in effect. `unlogged` is the default.

`\beginpicture`

This command is used to start PICTEX pictures.

`\betweenarrows` {*text*} [`[`$[o_x][o_y]$`]`] [`<`*xshift*`,`*yshift*`>`] `from` $xcoord_s$ $ycoord_s$ `to` $xcoord_e$ $ycoord_e$

> This command centres *text* between a pair of arrows pointing outwards. `<`*xshift*`,`*yshift*`>` and `[`$[o_x][o_y]$`]` have the same effect as in the `\put` command. ($xcoord_s$,$ycoord_s$) and ($xcoord_e$,$ycoord_e$) are the start and end coordinates of the arrow pair. Either $xcoord_s$ and $xcoord_e$ should be the same, or $ycoord_s$ and $ycoord_e$ should be the same.

`\circulararc` θ `degrees from` $xcoord_s$ $ycoord_s$ `center at` $xcoord_c$ $ycoord_c$

> This command draws an arc of a circle with a centre at ($xcoord_c$, $ycoord_c$); the arc starts from ($xcoord_s$,$ycoord_s$) and extends anticlockwise through θ degrees. θ can have any real value between -360 and 360.

`\Divide` `<`*dividend*`>` `by` `<`*divisor*`>` `forming` `<`*quotient*`>`

> This is PiCTeX's division command for dimensions. *dividend* and *divisor* may be explicit dimensions or dimension registers; *quotient* must be a dimension register.

`\dontsavelinesandcurves`

> This command stops PiCTeX from saving plot locations to a file (see `\savelinesandcurves`).

`\ellipticalarc axes ratio` ξ`:`η θ `degrees from` $xcoord_s$ $ycoord_s$ `center at` $xcoord_c$ $ycoord_c$

> This command draws an arc of an ellipse with a centre at ($xcoord_c$, $ycoord_c$); the arc starts from ($xcoord_s$,$ycoord_s$) and extends anticlockwise through θ degrees. ξ and η are numbers proportional to the lengths of the horizontal and vertical axes of the ellipse.

`\endpicture`

> This command terminates a PiCTeX picture.

`\endpicturesave` `<`*xreg*`,`*yreg*`>`

> This command is used to terminate sub-pictures, saving the left edge and baseline in *xreg* and *yreg*. If the subpicture is then `\put` at (*xcoord*,*ycoord*) with the options '`[Bl]` `<`*xreg*`,`*yreg*`>`', the reference point of the sub-picture will be at (*xcoord*,*ycoord*).

`\findlength` {*curve commands*}

> PiCTeX executes the curve drawing commands specified and puts the length into the dimension register `\totalarclength`. This can be used as the λ argument to `\setdotsnear` and `\setdashesnear`.

`\frame` [`<`*separation*`>`] {*text*}

> This command frames *text*, with an optional border of *separation*. This command has its normal LaTeX meaning outside of PiCTeX pictures, but `\pictexframe` can be used outside of PiCTeX pictures to get the same effect as PiCTeX's `\frame`.

`\grid` {*c*} {*r*}

> This command partitions the the plot area in to *c* columns and *r* rows.

`\gridlines`

> This command sets the default for the `andacross/butnotacross` option of the `axis` command to be `andacross`.

`\hshade` y_0 $x_0^{(l)}$ $x_0^{(r)}$ `...` [`<`$\epsilon_{l;i}$`,`$\epsilon_{r;i}$`,`$\epsilon_{d;i}$`,`$\epsilon_{u;i}$`>`] y_i $x_i^{(l)}$ $x_i^{(r)}$ `... /`

`\hshade` y_0 $x_0^{(l)}$ $x_0^{(r)}$ `...` [`<`$\epsilon_{l;i}$`,`$\epsilon_{r;i}$`,`$\epsilon_{d;i}$`,`$\epsilon_{u;i}$`>`] y_{2i-1} $x_{2i-1}^{(l)}$ $x_{2i-1}^{(r)}$ y_{2i} $x_{2i}^{(l)}$ $x_{2i}^{(r)}$ `... /`

> This command shades a region with piecewise linear/quadratic left and right boundaries. Subregions are defined by the coordinates ($x_n^{(l)}$,y_n), ($x_n^{(r)}$,y_n), ($x_{n+1}^{(r)}$,y_{n+1}) and ($x_{n+1}^{(l)}$,y_{n+1}). The relations $y_n < y_{n+1}$ and $x_n^{(l)} \leq x_n^{(r)}$ should hold. For the duration of the shading the optional edge effect field '`<`$\epsilon_{l;i}$`,`$\epsilon_{r;i}$`,`$\epsilon_{d;i}$`,`$\epsilon_{u;i}$`>`' overrides the specifications made by `\setshadesymbol`. The second form should be used when `\setquadratic` is in effect.

`\inboundscheckoff`

> This command disables checking whether plot symbols are outside the current plot area.

`\inboundscheckon`

This command enables checking whether plot symbols are outside the current plot area.

`\invisibleaxes`

This command sets the default for the `visible/invisible` option of the `axis` command to be `invisible`.

`\lines` [`[`*o*`]`] {*line*$_1$`\cr` *line*$_2$`\cr ...` }
`\Lines` [`[`*o*`]`] {*line*$_1$`\cr` *line*$_2$`\cr ...` }

These commands produce stacks of lines, spaced normally. The lines will be left justified if *o* is '`l`', right justified if *o* is '`r`', and centred otherwise. `\Lines` is similar to `\lines`, except the baseline of the stack is the baseline of the top line instead of the baseline of the bottom line.

`\loggedticks`

This command sets the default for the `logged/unlogged` option of the `axis` command to be `logged`.

`\multiput`{*text*} [`[`[o_x][o_y]`]`] [`<`*xshift*`,`*yshift*`>`] `at "`*file name*`"`
`\multiput` {*text*} [`[`[o_x][o_y]`]`] [`<`*xshift*`,`*yshift*`>`] `at ...` *xcoord ycoord* `...` `*`*n dxcoord dycoord* `... /`

This command is used to `\put` copies of the same text at multiple locations. The text will by put at each (*xcoord*,*ycoord*), and at each ($xcoord + i \cdot dxcoord$,$ycoord + i \cdot dycoord$) for i from 1 to n.

`\nogridlines`

This command sets the default for the `andacross/butnotacross` option of the `axis` command to be `butnotacross`.

`\normalgraphs`

This command resets the default `axis` options and values for the axis parameters.

`\placehypotenuse for <`ξ`> and <`η`> in <`ζ`>`

This command calculates Euclidean distance $\zeta = \sqrt{\xi^2 + \eta^2}$. ξ and η may be explicit dimensions or dimension registers; ζ must be a dimension register.

`\placevalueinpts of <`*dimension register*`> in` {*control sequence*}

This command puts the value of *dimension register*, in points, into *control sequence*.

`\plot "`*file name*`"`
`\plot` *xcoord*$_0$ *ycoord*$_0$ *xcoord*$_1$ *ycoord*$_1$ *xcoord*$_2$ *ycoord*$_2$ `... /`

This commands plots the points given (or points from a file, if the first form is used), in the current *interpolation mode*. The interpolation modes are selected by the commands `\setbars`, `\sethistograms`, `\setlinear` and `\setquadratic`.

`\plotheading` {*heading*}

This command places *heading* centred above the plot area.

`\put` {*text*} [`[`[o_x][o_y]`]`] [`<`*xshift*`,`*yshift*`>`] `at` *xcoord ycoord*

This commands places *text* with its enclosing box centred about (*xcoord*,*ycoord*). If o_x is '`r`' or '`l`' the right or left edge of the box will be aligned on *xcoord*. If o_y is '`t`', '`b`' or '`B`', the top, bottom, or baseline will be aligned on *ycoord*. If `<`*xshift*`,`*yshift*`>` is specified, the object will be shifted *xshift* right and *yshift* up from where it would otherwise go.

`\putbar` [`<`*xshift*`,`*yshift*`>`] `breadth <`β`> from` *xcoord*$_s$ *ycoord*$_s$ `to` *xcoord*$_e$ *ycoord*$_e$

This command draws a rectangle which has (*xcoord*$_s$,*ycoord*$_s$) and (*xcoord*$_e$,*ycoord*$_e$) as the mid-points of opposite sides of length β. Either *xcoord*$_s$ and *xcoord*$_e$ should be the same, or *ycoord*$_s$ and *ycoord*$_e$ should be the same. `<`*xshift*`,`*yshift*`>` has the same effect as in the `\put` command.

`\putrectangle` [`<`*xshift*`,`*yshift*`>`] `corners at` *xcoord*$_s$ *ycoord*$_s$ `and` *xcoord*$_e$ *ycoord*$_e$

This command draws a rectangle with opposite corners at the points (*xcoord*$_s$,*ycoord*$_s$) and (*xcoord*$_e$,*ycoord*$_e$).

`\putrule` [`<`*xshift*`,`*yshift*`>`] `from` $xcoord_s$ $ycoord_s$ `to` $xcoord_e$ $ycoord_e$

This command draws a rule from the point ($xcoord_s$,$ycoord_s$) to the point ($xcoord_e$,$ycoord_e$), with breadth `\linethickness`. Either $xcoord_s$ and $xcoord_e$ should be the same, or $ycoord_s$ and $ycoord_e$ should be the same. `<`*xshift*`,`*yshift*`>` has the same effect as in the `\put` command.

`\rectangle <`*w*`> <`*h*`>`

This command draws a rectangle of width w and height h, with its baseline on its bottom edge.

`\replot "`*file name*`"`

This command replots lines and curves which were saved to a file by `\savelinesandcurves`.

`\savelinesandcurves on "`*file name*`"`

This command writes out the locations at which it places plot symbols while plotting lines (not rules) and curves.

`\setbars` [`<`*xshift*`,`*yshift*`>`] `breadth <`β`> at` z `=` *zcoord*
[`baselabels (`[`[`[o_x][o_y]`]`] [`<`*xshift*`,`*yshift*`>`]`)`]
[`endlabels (`[`[`[o_x][o_y]`]`] [`<`*xshift*`,`*yshift*`>`]`)`]

This command sets the interpolation mode to bar plotting mode. If z is '`x`', the bars start from $x = zcoord$ and extend horizontally, and if z is '`y`', the bars start from $y = zcoord$ and extend vertically. `<`*xshift*`,`*yshift*`>` has the same effect as in the `\put` command. Labels can be attached to the bases of the bars with the `baselabels` option. Each coordinate specification in the `\plot` command should be followed by the appropriate label, enclosed in quotation marks. The orientation and shifts may be used to adjust the label position. Labels can similarly be attached to the ends of the bars with the `endlabels` option.

`\setcoordinatemode`

This command cancels `\setdimensionmode`.

`\setcoordinatesystem` [`units <`*xunit*`,`*yunit*`>`] [`point at` *xcoord* *ycoord*]

This command redefines the coordinate system in use. *xunit* is the size of one unit on the x-axis, *yunit* is the size of one unit on the y-axis. The `point` option sets the reference point for the coordinate system. The reference points of all of the coordinate systems in a picture are aligned by PICTEX.

`\setdashes` [`<`ℓ`>`]

This command resets the line pattern to be dashes of length ℓ followed by gaps of length ℓ.

`\setdashesnear <`ℓ`> for <`λ`>`

This command sets the line pattern to be dashes of about length ℓ, so that a line of length λ starts and ends with a complete dash.

`\setdashpattern <`d_1`,`g_1`,`d_2`,`g_2`,...>`

This command resets the line pattern to be a dash of length d_1 followed by a gap of length g_1, followed by a dash of length d_2, followed by a gap of length g_2, etc.

`\setdimensionmode`

This command sets dimension mode; each location in this mode should be specified by the absolute distance horizontally and vertically from the origin, as dimensions.

`\setdots` [`<`ℓ`>`]

This command resets the line pattern to be dots spaced distance ℓ apart.

`\setdotsnear <`ℓ`> for <`λ`>`

This command sets the line pattern to be dots spaced about distance ℓ apart, so that a line of length λ starts and ends with a dot.

`\sethistograms`

This command sets the interpolation mode to histogram mode. In this mode, `\plot` plots histograms composed of rectangles with corners at ($xcoord_0$,$ycoord_0$) and ($xcoord_1$,$ycoord_1$), ($xcoord_1$,$ycoord_0$) and ($xcoord_2$,$ycoord_2$), etc.

`\setlinear`

This command sets the interpolation mode to linear mode. In this mode, `\plot` draws straight lines between coordinates.

`\setplotarea x from` *xcoord*$_l$ `to` *xcoord*$_r$`, y from` *ycoord*$_b$ `to` *ycoord*$_t$

This command sets the current plot area to be a rectangle from (*xcoord*$_l$,*ycoord*$_b$) to (*xcoord*$_r$,*ycoord*$_t$).

`\setplotsymbol (`{*plot symbol*} [`[`[o_x][o_y]`]`] [`<`*xshift*`,`*yshift*`>`]`)`

This command sets the symbol which is used to make lines and curves to be *plot symbol.* `<`*xshift*`,`*yshift*`>` and `[`[o_x][o_y]`]` have the same effect as in the `\put` command.

`\setquadratic`

This command sets the interpolation mode to be quadratic mode. In this mode, quadratic arcs are drawn through the `\plot` coordinates.

`\setshadegrid` [`span <`*s*`>`] [`point at` *xcoord ycoord*]

This command resets the anchor point of the grid used for shading to be (*xcoord*,*ycoord*), and the size of the grid to be *s*.

`\setshadesymbol` [`<`ϵ_l`,`ϵ_r`,`ϵ_d`,`ϵ_u`>`] `(`{*shade symbol*} [`[`[o_x][o_y]`]`] [`<`*xshift*`,`*yshift*`>`]`)`

This command resets the symbol used to shade areas to be *shade symbol.* The optional 'edge effects' field `<`ϵ_l`,`ϵ_r`,`ϵ_d`,`ϵ_u`>` specifies the distances from the left, right, bottom and top edges within which the shade symbol will *not* be placed. 0pt may be specified by '`z`'. `<`*xshift*`,`*yshift*`>` and `[`[o_x][o_y]`]` have the same effect as in the `\put` command.

`\setsolid` This command restores the line pattern to draw solid lines.

`\shaderectanglesoff`

This command cancels `\shaderectangleson`.

`\shaderectangleson`

This command causes all rectangles plotted by PICTEX to be shaded automatically.

`\stack` [`[`*o*`]`] [`<`*leading*`>`]{*list*}

This command stacks textual items vertically. *list* is a list of items to be stacked, from top to bottom, separated by commas. Items are left justified if *o* is '`l`', right justified if *o* is '`r`', and centred otherwise. *leading* is the distance separating the enclosing boxes of the items in the stack. The baseline of the stack is the baseline of the bottom item.

`\startrotation` [`by` cos(θ) sin(θ)] [`about` x_p y_p]

This command causes PICTEX to rotate lines, curves, shading patterns, and `\put` coordinates by θ degrees anticlockwise around the point (x_p,y_p). The rotation lasts until a `\stoprotation`, or until the enclosing group ends.

`\stoprotation`

This command cancels any rotation in effect.

`\ticksin` This command sets the default for the `in/out` option of the `axis` command to be `in`.

`\ticksout` This command sets the default for the `in/out` option of the `axis` command to be `out`.

`\unloggedticks`

This command sets the default for the `logged/unlogged` option of the `axis` command to be `unlogged`.

`\visibleaxes`

This command sets the default for the `visible/invisible` option of the `axis` command to be `visible`.

`\vshade` $x_0\ y_0^{(b)}\ y_0^{(t)}\ \ldots\ [<\epsilon_{l;i},\epsilon_{r;i},\epsilon_{d;i},\epsilon_{u;i}>]\ x_i\ y_i^{(b)}\ y_i^{(t)}\ \ldots$ /
`\vshade` $x_0\ y_0^{(b)}\ y_0^{(t)}\ \ldots\ [<\epsilon_{l;i},\epsilon_{r;i},\epsilon_{d;i},\epsilon_{u;i}>]\ x_{2i-1}\ y_{2i-1}^{(b)}\ y_{2i-1}^{(t)}\ x_{2i}\ y_{2i}^{(b)}\ y_{2i}^{(t)}\ \ldots$ /

This command shades a region with piecewise linear/quadratic bottom and top boundaries. Sub-regions are defined by the coordinates $(x_n,y_n^{(b)})$, $(x_n,y_n^{(t)})$, $(x_{n+1},y_{n+1}^{(t)})$ and $(x_{n+1},y_{n+1}^{(b)})$. The relations $x_n < x_{n+1}$ and $y_n^{(b)} \leq y_n^{(t)}$ should hold. For the duration of the shading the optional edge effect field '$<\epsilon_{l;i},\epsilon_{r;i},\epsilon_{d;i},\epsilon_{u;i}>$' overrides the specifications made by `\setshadesymbol`. The second form should be used when `\setquadratic` is in effect.

`\writesavefile` {*message*}

This command writes out the text *message* on the file specified by the most recent `\savelinesandcurves` command.

`\Xdistance`{*xcoord*}

This command is used to get the horizontal distance from the point *xcoord* in the current coordinate system to the origin.

`\Ydistance`{*ycoord*}

This command is used to get the vertical distance from the point *ycoord* in the current coordinate system to the origin.

2 Parameters

The parameters which can be altered to change PICTEX's behaviour are:

`\headingtoplotskip`

This is the distance between the baseline of the heading and the top of the plot area, or the top of the top axis structure.

`\linethickness`

This parameter is the default thickness of axes, tick marks, and grid lines. This control sequence has its normal LaTeX meaning outside of PICTEX pictures, but `\pictexlinethickness` can be used outside of PICTEX pictures to get the same effect as PICTEX's `\linethickness`.

`\longticklength`

This is the default length of long ticks.

`\plotsymbolspacing`

This parameter defines the distance between plotted symbols in lines and curves.

`\shortticklength`

This is the default length of short ticks.

`\stackleading`

This is the default space put between items in a `stack`.

`\tickstovaluesleading`

This parameter defines the distance separating the ticks and the box enclosing the tick values.

`\totalarclength`

This register in general contains the length of the last line or curve.

`\valuestolabelleading`

This is the distance separating the box enclosing the tick values and the box enclosing the axis label.

3 Miscellaneous

A couple of extra commands are provided by PICTEX for formatting names:

`\PiC` This command produces 'PIC'.

`\PiCTeX` This command produces 'PICTEX'.