base

keys:	**[from]**	*<number>*	*Plist* picture
	[to]	*<number>*	output picture
	position	*<x>*, *<y>*	centre of region to which fit is restricted
	radius	*<number>*	radius of region to which fit is restricted
	numbers	*<n1>*, *<n2>*	serial number of positions to which fit is restricted
	tolerance	*<number>*	fractional deviation from initial (estimated) lattice sites beyond which sites are excluded from fit
	mark	*<number>*	mark the final deviations of all positions from the lattice on the display
		<yes or no>	
	times	*<number>*	if ***mark***, magnification of display marking
options:	**uvonly**		fit lattice base vectors *u*, *u2* and *v*, *v2* only, preserving lattice origin *w*, *w2*
	verify		verify details of fitting process at the console

Use the **base** command to fit a lattice to a list of positions in a *Plist* picture. This command refines initial estimates that you provide of the lattice base vectors *u* and *v* and the lattice origin *w*, using a least-squares criterion and reports the quality of the resulting fit. For further detail of *Plist* pictures, refer to *Appendix A: Picture Types*.

Note that the commands **peaks** and **xwires list** produce a list of positions that can be used by **base** to fit a lattice.

Examples

```
u=10,0 v=0,10 w=0,0; base 51
```

This command fits a lattice, roughly 10 pixels square, to sites listed in picture 51.

```
base 51 radius 100 position w,w2 mark display
```

This command fits positions within 100 pixels of the lattice origin *w*, and marks the final deviations on the display.

```
base numbers 100,150 uvonly verify
```

This command fits positions 100 to 150 only, with the lattice origin fixed at the picture origin, printing

base

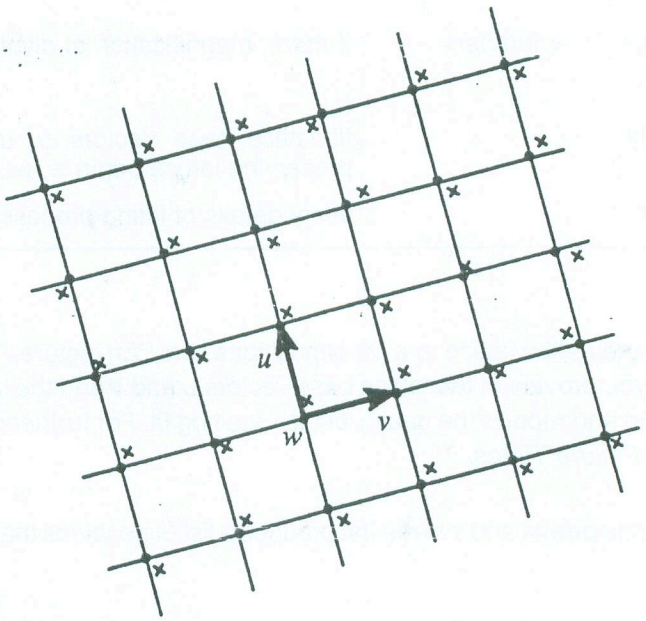
details of the fitting process at the console.

```
base 51 to 52 tolerance .1
```

This command produces a new *Plist* 52 containing only those positions from 51 that lie within 0.1 lattice vectors of a fitted lattice site.

Description

base refines the values that you supply for the base vectors *u* and *v* and the lattice origin *w*. If you can supply an accurate value for the lattice origin, *w*, (for example, because you are fitting a power spectrum for which *w* must be 0,0), you can suppress the fitting of *w* using the **uvonly** option. The diagram below illustrates the **base** command.



w = lattice origin

u, *v* = lattice base vectors

× marks position originally supplied in *Plist* picture

The initial estimates that you provide of *u*, *v* and *w* (in picture coordinates) should be accurate enough to permit correct indexing of most positions. If you cannot achieve such accuracy, restrict the fit initially to a limited region and then use **base** a second time without the restriction. To restrict a fit to a region use one of the keys: **position** and **radius**.

To prevent a few spurious positions from biasing the fitted lattice, positions are ignored if they are not reasonably near a site of the estimated lattice – specifically, if their indices (coordinates in terms of the lattice base vectors) are not within 0.3 of an integer. The key **tolerance** allows you to alter this threshold value; a value of 0.5 or greater eliminates selection on this basis.

base

If you specify the key **to** explicitly, as in the last command example, an output *Plist* is produced which includes only those positions included in the fitting process (that is, those within any defined subregion and within the relevant tolerance of the lattice).

base sets the variables *n* and *r* to the number of positions fitted, and their *r.m.s.* deviation respectively. If **mark** is set, the final deviations of all positions from the lattice are marked via small lines drawn from the positions in the directions of the corresponding lattice site, but 5 times larger than the actual deviation for visibility. You can alter the magnification factor of these marking lines using the **times** key.

Notes

restrictions:	*Plist* type pictures only
display marking:	final position deviations
form used internally:	complex
variables used:	*u(2)*, *v(2)* (initial estimates for lattice base vectors)
	w(2) (initial estimate for lattice origin)
variables set:	*u(2)*, *v(2)* (base vectors of fitted lattice)
	w(2) (origin of fitted lattice)
	n (number of sites included in fit)
	r (r.m.s deviation in source pixels between included sites and final fitted lattice)
see also:	**lattice, peaks, strain, xwires list**

Defaults and Ranges

keys/options	defaults	range
[from]	current picture number, held in the variable *select*	valid picture number
[to]	no output	valid picture number
position	position 0,0	within bounds of picture (real numbers)
radius	infinite	real number
numbers	all positions	1 to total number of points in the *Plist* picture
tolerance	tolerance 0.3	real number in range 0 to 0.5
mark	mark off	see *Appendix C*
times	times 5	positive integer
verify	verification off	