

newpar: change parameter values

Adjust one or more of the model parameters.

Syntax: **newpar** [modelName:]<index range> [<param spec list>]
 newpar [modelName:]<index> = <coupling expression>
 newpar 0

where

<param spec list> ::= <param value> <delta> <param range spec>

<param range spec> ::= <hard min> <soft min> <soft max> <hard max>

For response parameters (created with the **gain** or **rmodel** command):

rnewpar [<sourceNum>:]<idx range> [<param spec list>]

rnewpar [<sourceNum>:]<index> = <coupling expression>

The model parameters are accessed through their model parameter indices. For example, the first parameter of the first model component generally is model parameter 1, etc. The first command line argument, <index range>, gives the indices' parameters to be modified by the **newpar** command. The default value is the range from the previous invocation of **newpar**. The remaining arguments can be used to update the parameter specification. If the parameter specification is omitted from the command line, then the user is explicitly prompted for it. The first two arguments of the parameter specification are:

<param value>	The trial value of the parameter used initially in the fit
<delta>	The step size used in the numerical determination of the derivatives used during the fitting process. When delta is set to zero, the parameter is not adjustable during the fit. This value may be overridden for all parameters by the xset delta command option, which will apply a proportional rather than a fixed delta.

The four arguments of the range specification determine the range of acceptable values for the parameter. The soft limits should include the range of expected parameter behavior. Between the hard and soft limits, the parameter is made stiffer to adjustment by the minimization routine invoked by the **fit** command. The parameter is never allowed to have a value at or outside the hard limits. (One exception to this rule: the parameter can equal one of the hard limits if the soft limits have been placed outside the hard limit).

A slash (/) will set all the six parameter specification values (value, delta, range specification) to the previous value (default for a new model, current value if the parameter has previously been set or fit).

The sequence /* leaves all parameters unchanged (in the case of a new model, to be set to the default).

```
newpar 0
```

Prints the current parameter settings.

Parameter Links

Coupling of parameters allows parameters in a model to always have the same value or to be related by an expression. The expression is a polynomial function of the other parameters (XSPEC will reject attempts to link parameters to themselves!). Also, XSPEC12 allows parameters to be designated in their initialization file to be fixed, i.e. never variable during a fit, or to act as switches that change the mode in which a theoretical component is calculated (i.e. it may be interpolated or analytically calculated). “scale” or “switch” parameters cannot be linked to any other type of parameter, but only to other scale or switch parameters. Details of parameter types are explained in more detail in Appendix C.

The syntax for linking parameters is

```
XSPEC12> newpar <par> = f( par ),
```

where f is a polynomial in the (other) parameters with real coefficients. N.B. Integers appearing in f that are within the range of existing parameter numbers will be interpreted as parameters: to avoid confusion, if a real number is intended it should include a decimal point. Integers larger than the last parameter number will be interpreted as integers. Parameters of named models must have their index numbers prefixed by [modelName:].

If there are multiple data groups present, then the parameters of models associated with datagroups greater than 1 (“secondary models”) are coupled by default to their “primary” counterparts. For example, if there are 5 parameters in the model and 3 datagroups present, then the model command will prompt for 15 parameters. If the user types

```
XSPEC12> model <expression>
```

```
XSPEC12> /*
```

Then parameters 1-5 will be set to their values specified in the initialization (“model.dat”) file. Parameters 6-15 will be linked to their counterparts, i.e. as if the user had typed

```
XSPEC12> newpar 6 = 1
```

```
XSPEC12> newpar 7 = 2
```

...

```
XSPEC12> newpar 11 = 1
```

And so on.

Examples:

The total number of model parameters for the example is four.

```
XSPEC12> newpar 2 0.1
```

```
//The value of the second parameter is set to 0.1.
```

```
XSPEC12> newpar 3-4
```

```
//The program will prompt for a specification for the 3rd
```

```
// parameter (comp gives the name of the corresponding model  
component)
```

```
comp:param3>0.001, 0
```

```
//which has its value set to 0.001 and its delta set to zero,  
fixing
```

```
// it in later fits.The program now prompts for a specification  
for
```

```
// the 4th parameter
```

```
comp:param4>21
```

```
// which is set to 21.As there is no 5th parameter, the program
```

```
// displays a summary and returns to command level.
```

```
XSPEC12> newpar ,,.001
```

```
//The value of the delta of the 3rd parameter (which is the  
default
```

```
// index as it was the first parameter modified in the previous
```

```
// newpar invocation) is set to 0.001, allowing it to be adjusted
```

```
// during any fits.
```

The total number of parameters for this example is eight.

```
XSPEC12> newpar 4 = 1
```

```
//The value of parameter 4 is set to the value of parameter 1.
```

```
//This has the consequence of model parameter 4 being frozen at  
the
```

```
// value of parameter 1 during subsequent fitting procedures.
```

```
// If model parameter 1 is a free parameter, then both parameters
```

```
// 1 and 4 change their values simultaneously in the fit  
procedure.
```

```
XSPEC12> newpar 4 = 3/5 + 6.7
```

```
//The value of parameter 4 is set to the value of
```

```
// (parameter 3/ parameter 5) plus 6.7
```

```
XSPEC12> newpar 6 = 3 * .1 - 9.5
//The value of parameter 6 is set to 0.1 times the
// value of parameter 3 minus 9.5
XSPEC12> newpar 5 = 2 + 5.
//The value of parameter 5 is set to the value
// of parameter 2 plus 5.
XSPEC12> newpar 8 = 1 / 4.6
//parameter 8 is set to parameter 1 divided by 4.6
XSPEC12> untie 6
//Makes parameter 6 independent of parameter 3 and a free
//parameter.
```