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Autodesk® PowerShape® 2019

# Using Macros with PowerShape





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# Customizing PowerShape

You can customize the behaviour of PowerShape by creating:

- Macros (see page 5)
- OLE applications (see page 129), which can be either:
  - HTML-based
  - Add-in applications

Both macros and add-in applications use special object information (see page 142) macros.

These features enable you to tailor PowerShape to your needs.

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# Macros

A macro file contains commands and comments. The main use of a macro file is to store frequently-used or complex sequences of commands for repeated use.

When you have mastered writing macro files, you can tailor PowerShape for your own use, and greatly enhance its power and flexibility. For example, you may need to create a number of standard mold parts, such as nuts and bolts in your model. You can write a macro to create nuts and bolts of any size and at any position. So, any time you wish to add a nut, you just run the macro and define the size of the nut and its position.



*In the example macros, it is important to remember the following:*

- *Commands are not case-sensitive, so `if` and `IF` are interchangeable.*
- *Any blank lines start with `//` or `$$` to indicate a comment line. Any blank lines in the following examples are there to improve readability.*

## Creating macros

### Recording macros

An easy way to create a macro file is to record the commands as you are working. When you record macros, you create a set of commands that are carried out in the order you record them.

To record a macro:

- 1 Select Home tab > Macro panel > Record to display the **Record Macro** dialog:



- 2 Select the location you want to save the macro to using the **Save in** drop-down list.
- 3 In the **File name** box, enter the name of the file you want to record to. If you enter the name of an existing file, it is overwritten with the new commands.
- 4 Click **Save** to begin recording the macro.
- 5 Perform the actions you want to record.
- 6 Select Home tab > Macro panel > Record to stop recording. You can use any text editor to view and edit a macro.

If you record a macro of a Paint Triangles or Mesh command, an extra macro file is created. This file is named with the following convention:

`<psmacroname>_cc_<nnnn>.mac`



where

- `<psmacroname>` is the name of macro being recorded.
- `<nnnn>` is a four digit number. This number is incremented by one each time an embedded mode is used.

For further information see the Macro tutorial (see page 51).

## Writing macros

Written macros can be longer, and more elaborate than those you record. For example, you can add comments or add testing conditions.

Use any text editor to create or edit your own macro files:

- 1 Type your own macro commands into the text editor.
- 2 Save the file in `.mac` format.

You can then run the macro (see page 9).

When you interact with the PowerShape interface, commands are sent to the program. These are the commands that you must write into your macro file if you want to drive PowerShape using a macro.

To find macro commands used by PowerShape:

- 1 Record a macro (see page 6) of the operations you want to find the commands for. This records the operations as command lines.
- 2 Open the macro file using a text editor.
- 3 Copy the commands into your macro.

The following table lists examples of commands you can add to macros:

<code>\$\$</code> <code>//</code>	add comments to remind you what each part of the macro does
<code>input</code>	allow users to input information whilst the macro is running
<code>print</code>	output information from the macro
<code>let</code> <code>int</code> <code>string</code> <code>real</code>	store information in variables
<code>let\$e=5+(6*)</code>	build up expressions (for example, <code>5+(6*2)</code> ) and assign their values to variables

<code>if</code> <code>switch</code>	decide which commands are carried out next depending on the value of a variable
<code>while</code>	repeat a set of commands a number of times
<code>goto</code> <code>label</code>	jump from one command line to another
<code>macro run</code>	run one macro from within another and pass information to a macro
<code>export</code>	export variables from a macro
<code>execute step</code> <code>execute run</code>	step a block of commands in a macro while it is running
<code>execute</code> <code>command \$var</code>	run the command indicated by the variable (see page 92)
<code>skip</code>	skip a block of commands
<code>input free</code> <code>execute pause</code>	pause a running macro
<code>return</code>	end a macro

### ***Adding comments in macros***

It is good practice to put comments into a macro file to explain what it does. A comment is a line of text which has no effect on the running of the macro file, but which helps other users of the macro to understand what it does. Comment lines start with `//` or `$$`. For example:

```
// This macro file deletes any coincident
// Pcurves from a surface.
```

It is also good practice to have comments explaining what each section of the macro file does.

A `$$` comment can be added only at the beginning of a line. You cannot put a `$$` comment on the same line as a command (except after a label). For example, the following string is NOT allowed:

```
LET $a = ($b*9/360) $$ This calculates the angle
```

However you can use this syntax when using the `//` comment. For example, this is allowed:

```
LET $a = ($b*9/360) // This calculates the angle
```

We suggest that you put the comments to describe commands and then the commands. For example:

```
// Calculating the angle
```

```
LET $a = ($b*9/360)
```

Another use of comments is to temporarily remove a command from a macro. To do this, insert `$$` or `//` at the beginning of the line which contains the command you want to remove. For example:

```
// LET $a = ($b*9/360)  
// PRINT $a
```

This is known as *commenting out* a command.

## Running macros

To run a previously recorded macro:

- 1 Select Home tab > Macro panel > Macro > Run to display the **Run Macro** dialog.
- 2 Select the macro you want to run.
- 3 Click **Open** to run the macro.

If you want to stop the macro while it is running, press the **Esc** key. The macro finishes the command it is currently processing and stops.

In addition to the Run option, the Step option runs one command in the macro at a time. This enables you to watch the macro in detail and check that each section is working correctly.

To step through a macro:

- 1 Select Home tab > Macro panel > Macro > Step. The **Step Through Macro** dialog is displayed.
- 2 Select the macro you want to run.
- 3 Click **Open** to start the macro.

The Command window is displayed, showing the first command in the macro, for example:

```
Macro 1: Line 1: command in first line >
```

- 4 Select the Command window, and press the **Enter** key to run the command.

The next command is displayed:

```
Macro 1: Line 2: command in second line >
```

- 5 Continue pressing the **Enter** key to run each command in the macro.

To stop a macro at any point, select Home tab > Macro panel > Macro > Abandon.

## Creating user-input information into a macro

Most macros require some user interaction. For example, asking the user to enter the position or the dimensions of the object. The information supplied by the user interaction is stored in a variable within the macro.

There are two ways to enter values into a macro variable:

- Set all the variables in a macro file before running it.

This requires you to edit the macro every time you want to change the variables. This can make it difficult for anyone other than the originator to use it.

- Prompt the user for values when the macro is running.

This is a neater method and you may also input values as part of the macro's initiation command.

To prompt a user for information, use the **INPUT** command. For each command, you can ask for:

- a point (see page 10)
- a selection of items (see page 11)
- a number (see page 12)
- a string (see page 13)
- a yes or no response to a query (see page 13)

## Point information

If you want the user to enter a point, use the command:

```
INPUT POINT 'string' $variable_name
```

This command displays a dialog.

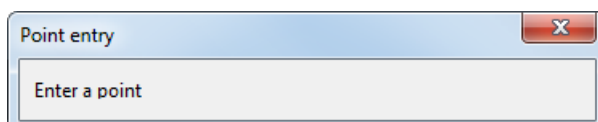
The characters in the string are displayed on the dialog and the X, Y, Z coordinates of the point entered are assigned to three variables:

- *variable\_name\_x*,
- *variable\_name\_y*
- *variable\_name\_z*.

**For example:**

```
INPUT POINT 'Enter a point' $centre_pos
```

This displays the following dialog when the macro is run.



The user enters a point by:

- clicking on the screen
- entering values into the status bar
- using the **Position** dialog.

The values of X, Y and Z are then assigned to variables:

- `centre_pos_x`
- `centre_pos_y`
- `centre_pos_z`

Print out the X, Y, Z values of the point you entered using the following:

- `print $variable_name_x`
- `print $variable_name_y`
- `print $variable_name_z`

To print out the X value of the point entered above, use **print** `$centre_pos_x`

The value of X will be printed in the Command window. To find the values for Y and Z, substitute y or z for x.

## Selection information

If you want the user to select one or more objects for use in the macro, use the command:

```
INPUT SELECTION 'string'
```

This command displays a dialog, which shows the number of objects selected. The characters in the string are used for the title on the dialog. When objects are selected, the number of objects selected is shown in the dialog.

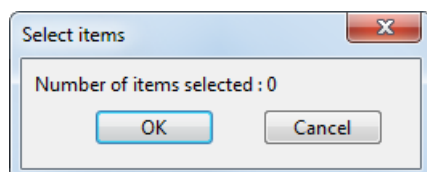


*No objects must be selected before using the input selection command.*

For example:

```
INPUT SELECTION 'Select items'
```

When a macro containing this command is run, the following dialog is displayed:



When items are selected, the dialog shows the number of objects that are selected.

When you click **OK**, the macro can use `selection` object information to display the number of selected objects. For example:

```
print selection.number
```

prints the number of objects selected.

```
print selection.object[0]
```

prints the type and name of the first object in the selection.

You can use the selection object information (see page 142) to check that the correct number or types of objects are selected.

### **Example - Select a line and check selection:**

This example asks the user to select a line. The macro then checks that a single line is selected. If a single line is not selected, an error message is displayed.

```
LET $no_line = 1
WHILE $no_line {
  select clearlist
  INPUT SELECTION 'select a line'
  IF (selection.number == 1) {
    LET $no_line = !(selection.type[0] == 'Line')
  }
  IF $no_line {
    PRINT ERROR 'You must select a single line'
  }
}
```

For further information see:

- `IF` (see page 34)
- `WHILE` loop (see page 39)

## **Number information**

Use this command to ask the user to enter a number.

```
INPUT NUMBER 'string' $variable_name
```

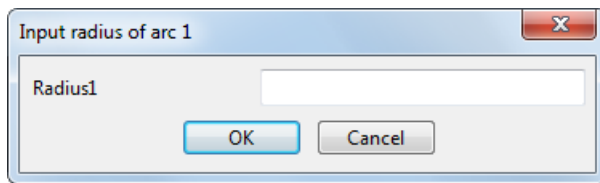
This command displays a dialog where:

- `'string'` is used as the dialog title.
- `variable_name` is the label of the text box.

For example:

```
INPUT NUMBER 'Input radius of arc 1' $Radius1
```

When the macro is run, the following dialog is displayed:



Enter a value and click **OK**. The value is assigned to variable *Radius1*.

## String information

Use the following command to request a text string:

```
INPUT TEXT 'string' $variable_name
```

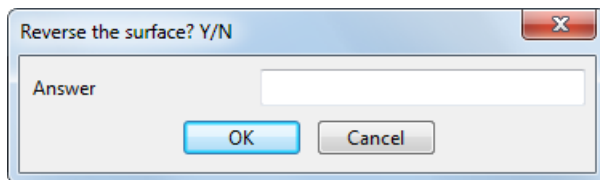
Like `INPUT NUMBER`, this command displays a dialog where:

- the *'string'* characters are used for the dialog title.
- *variable\_name* is the label of the text box.

For example:

```
INPUT TEXT 'Reverse the surface? Y/N' $Answer
```

When the macro is run, the following dialog is displayed:



Enter a value and click **OK**. The value is assigned to variable *Answer*.

## Query information

If you want to ask a question that requires a yes or no answer, use:

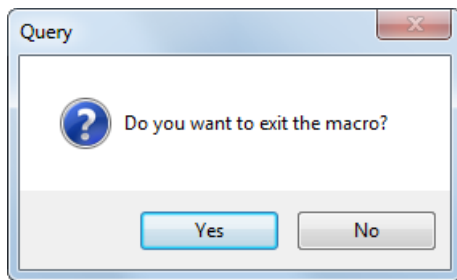
```
INPUT QUERY 'string' $variable_name
```

This command displays a dialog with **Yes** and **No** buttons. The question you want to ask is contained in the string. If the user selects **Yes**, then *\$variable\_name* becomes *1*, otherwise it becomes *0*.

For example:

```
INPUT QUERY 'Do you want to exit the macro?' $prompt
```

When the macro is run, the following dialog is displayed:



- If you click **Yes**, the variable `$prompt` becomes 1.
- If you click **No**, the variable becomes 0.

## Entering values during macro initiation

A user may initiate a macro so that the information required within the macro is also given. For example:

```
macro run name_of_file.mac var1 var2 ... varN
```

where *var1*, *var2*, ... ,*varN* are values of variables used in the macro.

If the name of a macro file contains spaces, the name must be included in double quotes. For example:

```
macro run "name of file.mac" 1 2.4
```

To import variables, you must declare them at the start of the macro using the following syntax.

```
ARGS{  
  TYPE variable1  
  TYPE variable2  
  .  
  .  
  .  
  TYPE variableN  
}  
Rest of macro
```

where `TYPE` is one of *INT*, *REAL*, or *STRING*.



*To display the Command window, double-click the Command box in the status bar.*

For example:

To run macro *test.mac* with values 1, variable *\$two* and string 'three', type the following in the Command window:



```
macro run test.mac 1 $two 'three'
```

In the macro, these values are defined as variables with their types at the start as:

```
ARGS{
Int variable1
Real variable2
String variable3
}
Rest of macro
```

So, in the following macro you must enter values that match the variable types.

```
ARGS{
Int i
Real j
String k
}
print $i
print $j
print $k
```

Start the macro using the following command:

```
macro run macro1.mac 34 78.7 'mouse'
```

It will print out

34

78.7

mouse



*ARG{ and ARG { are both valid formats. Comments can appear at the start of a macro with arguments.*

## Outputting information from a macro

### Displaying information

To display a message that does not require any information from the user, use `PRINT` command.

```
PRINT 'Type your message here'
```

For example:

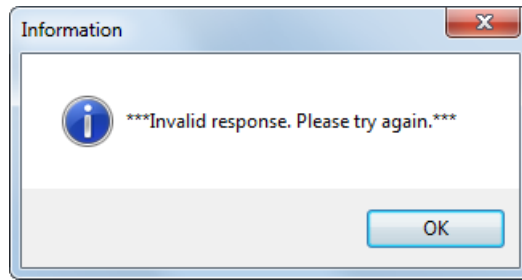
If a user provides an incorrect response, a macro displays an error message and prompts for another response:

```
PRINT '***Invalid response. Please try again.***'
```

You can also display error message dialogs when an invalid answer has been given, using:

```
PRINT ERROR '***Invalid response. Please try again.***'
```

This displays the following error on the screen.



To close the message, click **OK**.



*Messages can be displayed in the Command window or in dialogs. To open the Command window, double-click the Command box in the status bar.*

Output from the `PRINT` commands can also be sent to an `OUTFILE`.

To produce an outfile:

- 1 Open an `OUTFILE`. This can have a predefined name, or you can use a name that is entered at run time.

Use one the of the following methods:

- Open an `OUTFILE` with a given name

```
let filename = 'e:/homes/fred/report.txt'
FILE OUTFILE OPEN REPLACE $filename
```

You must give an absolute pathname to the file.

`REPLACE` gives permission to overwrite any existing file. If the file exists and `REPLACE` is omitted then you will be asked to confirm that the file can be overwritten.

- Open an `OUTFILE` with a name obtained from the user

```
FILE OUTFILE OPEN DIALOG
TITLE Create a report file
FILETYPES TXT File (.txt)|*.txt|txf
RAISE
```

The `TITLE` and `FILETYPES` are optional. The `FILETYPES` string consists of:

```
File type name | Regular expression | Default file extension
```

Example — to prompt the user to create an HTML file:

```
FILETYPES HTML File (.html) | *.html | html
```

- 2 Generate your report using the `PRINT` command.

```
PRINT ...  
PRINT 'This file is ' outfile.name '.'  
PRINT 'Report generated on ' date ' by ' user.name '.'  
PRINT ...
```

**3 Close the OUTFILE:**

```
FILE OUTFILE CLOSE
```

**4 Display the file in the browser:**

```
BROWSER SHOW
```

```
BROWSER GO $filename
```

The filename must start with a drive letter.

## Displaying values of variables

Use the `PRINT` command to display the values of variables. For example:

```
PRINT 'Lateral ' $lat_no ' does not exist.'
```

You may need to add spaces in strings to separate items in a **print** command.

For example:

```
PRINT 'Lateral ' $lat_no ' does not exist.'
```

displays

```
Lateral 5 does not exist.
```

```
PRINT 'Lateral' $lat_no 'does not exist.'
```

displays

```
Lateral5does not exist.
```

The `PRINT` command works for expressions that evaluate strings, vectors and lists.

For example:

```
print concatenate('abc'; 'def')
```

prints the string

```
abcdef
```

```
print cross([1; 2; 3]
```

prints the resulting vector

```
[40; -50.5; 76.23]
```

```
print atan2(-30; 40)
```

prints the arctangent

## Example macro to generate and display a report file

```
args{
    string filename
}
// report_example.mac
//
// An example of how a macro can generate and display a
report file.
// -----
//
// Open an html outfile to hold the report.
let use_dialog = $filename == 'dialog'
if $use_dialog {
    file outfile open Dialog
    Title Create a graphics report file
    FileTypes HTML File (.html)|*.html|html
    Raise
} else {
    // This must be an absolute filename.
    file outfile open replace $filename
}
//
// -----
// Print the report.
print '<html>'
print '<head>'
print '<title> Example of a Report File Generated by a
Macro</title>'
print '</head>'
print '<body bgcolor="#CCCC66">'
//
print '<h1> Example of a Report File Generated by a
Macro</h1>'
//
print 'This HTML file was generated and displayed in the
browser window'
print 'by a macro. It shows how'
print 'information about the graphics system can be
generated and'
print 'displayed.<p>'
//
print '<p>'
//
// The values of some graphics properties:
print 'Display lists are ' graphics.displaylists '<br>'
print 'Vertical sync is ' graphics.verticalsync '<br>'
print 'OpenGL version is ' graphics.openglversion '<br>'
//
let red_bits = graphics.intparam.RED_BITS
```

```

let green_bits = graphics.intparam.GREEN_BITS
let blue_bits = graphics.intparam.BLUE_BITS
//
let colour_depth = $red_bits + $green_bits + $blue_bits
//
print 'Colour depth is ' $colour_depth ' .<br>'
print 'Z-buffer depth is ' graphics.intparam.DEPTH_BITS
' .<br>'
//
print 'Window size is ' window[1].size.x ' by '
window[1].size.y ' pixels.<p>'
//
print 'OpenGL extensions supported are: <br><pre>'
//
graphics printextensions
//
print '</pre>'
//
// How to use the timer:
print 'Total test time is ' timer ' seconds.<br>'
//
print 'Test run by ' user.name ' on ' date ' .<p>'
//
// print 'Mailto <a
href="mailto:someone@autodesk.com">someone@autodesk.com</
a><p>'
//
let filename = outfile.name
print 'This file is ' $filename ' .<br>'
//
print '</body>'
print '</html>'
//
// -----
file outfile close
//
browser show
browser go $filename

```

## Using variables in macros

A variable enables you to store information for later use. You can define a variable using a name, for example *centre*. When you use variables in an expression, you must add a \$ to their name, for example:

```
LET $a = ($centre + 1)
```

A variable name cannot be a valid macro command, for example, you *cannot* use `$PRINT`, where `PRINT` is a macro command.

You can also assign values to variables (see page 23). For example, the following line defines variable *bolts* with type *integer* and assigns it a value of 5:

```
INT $bolts = 5
```

You can also assign values to variables by performing complex calculations.

## Variable types

A variable type specifies the kind of information that can be stored by the variable. A variable can have only one type. The type must be specified when you define it.

You can specify the following variable types:

- INT — integer numbers for example 1, 21, 5008
- REAL — real numbers for example 20.1, -70.5, 66.0
- STRING — for example 'hello'
- VECTOR
- LIST
- ERROR

### Determining the type of a variable or expression

Use the following command to determine the type of an expression or variable:

```
TYPE( ... )
```

The command returns a string that is:

```
INT  
REAL  
STRING  
VECTOR  
LIST  
ERROR
```

For example:

```
LET my_var = 17
PRINT TYPE($my_var)
// this prints INT
```

```
LET a = 12.345
PRINT TYPE($a)
// this prints REAL
```

```
PRINT TYPE('hello')
// this prints STRING
```

```
PRINT TYPE([1; 2; 3])
// this prints VECTOR
```

```
PRINT TYPE({'a'; 'b'; 'c'; 'd'})
// this prints LIST
```

```
PRINT TYPE(SQRT(-57))
// this prints ERROR, because you are trying to take square root of a
negative number.
```

### Converting variable types

You can use the following macro commands to convert a variable type to another variable type:

```
INTTOREAL
INTTOSTRING
REALTOINT
REALTOSTRING
STRINGTOINT
STRINGTOREAL
```

The following example fills variable *s* with value *10*:

```
INT frame_number = 10
string s = INTTOSTRING($frame_number)
```



*These macro commands cannot be used with print commands.*

## Renaming objects using variables

When an edit dialog is displayed for an object, the `VAR_NAME` and `NAME` commands enable you to rename the object using a variable.

Use `VAR_NAME` and `NAME` to rename the following:

- lines
- chamfers
- arcs
- curves
- composite curves
- points
- primitive surfaces
- general surfaces
- primitive solids
- general solids
- workplanes

### Example - Using `VAR_NAME` to change the name of an arc

The following uses the variable `$n` to name an arc '**joe**' when the **Arc** edit dialog is displayed.

```
let $n= 'joe'           initialises the $n variable
create arc full         to 'joe'
0 0 0
select
modify
VAR_NAME $n
accept                 names the arc 'joe'
```

## Using environment variables

Environment variables are different from other variables. They can be written at one macro level and read at a lower macro level.

You can use environment variables in the following ways:

- Set an environment variable using the `setenv` variable.

```
let path = 'e:/tmp'
setenv path
macro run print_path.mac
```



The macro *print\_path.mac* has access to a copy of the variable *path*. The macro called *print\_path.mac* contains the following:

```
print 'path = ' $path
```

- Print the contents of the environment using the **printenv** variable.

```
select > printenv  
path=e:/tmp
```

- Remove a variable from the environment using the **unsetenv** variable.

```
unsetenv path
```

- Export a variable (see page 47) into the environment of the calling macro using the **exportenv** variable

```
exportenv path
```

This allows a called macro to set up the environment for a number of other macros.

Lower level macros can access a copy of the environment variables. These macros can change the contents of the variables, but those changes are discarded when the macro returns its value.

## Assigning values to variables

Values are assigned to variables using the following syntax:

**LET \$variable = expression**

The \$ in front of the variable is optional.

You can:

- Assign constant values to variables.
- Use expressions to assign values to variables.
- You may also use existing variables to assign values to variables.

```
LET $new_variable = 45
```

```
LET new_variable = 45/36
```

```
LET new_variable = $existing_variable/36
```

- You can use a variable to define a new value to itself. For example,

```
LET $a = $a +1
```

This means add one to variable **a**.

- You can access individual characters of string variables and expressions.

```
LET my_str = 'model'
```

```
// Print the first character 'm'
```

```
Print (%my_str[1])
```

- You can get a sub-range of a string or list variable using the command:

```
RANGE(<arg1>; <arg2>; <arg3>)
```

Where:

- `<arg1>` is a string or list.
  - `<arg2>` is an integer specifying the start index (index starts at 1).
  - `<arg3>` is an integer specifying the number of characters or list elements to return.
- You can remove assigned values by using the command:

```
LET $a = null
```

If you are carrying out a command that you are certain does not expect a number, you can use:

```
TYPE $variable = expression
```

where `type` is **INT**, **REAL**, or **STRING**

You can also use:

```
$variable = expression
```

For example, you must use `LET` in the following:

```
create line
LET start_x = 10
LET start_y = 20
LET start_z = -50
$start_x $start_y $start_z
LET end_x = 20
LET end_y = 30
LET end_z = 50
$end_x $end_y $end_z
```

For further details, see:

- Using expressions in macros (see page 28)

## Using object information

You can assign object information (see page 142) to a macro variable, for example, at the start point of a line. Object information is accessed using syntax containing specific details of an object. The syntax is typically:

```
object type [object name] sub-object names
```

For example, if you have a line with the name **2**, then all the information about line is available by referring to `line[2]`.

The start coordinates of line 2 are accessed as follows:

```
line[2].start retrieves the start coordinates [x, y, z] of line 2.
```

```
line[2].start.x retrieves the x coordinate of the start of line 2.
```

```
line[2].start.y retrieves the y coordinate of the start of line 2.
```

```
line[2].start.z retrieves the z coordinate of the start of line 2.
```

Use this object information to assign values to variables.

**Example:** Create a full arc with its centre point at the start coordinates of line 2

```
LET $a = line[2].start.x
LET $b = line[2].start.y
LET $c = line[2].start.z
CREATE ARC
FULL
$a $b $c
```

### Assigning an object to a variable

Use the following syntax to assign an object to a variable.

```
LET $t = Line[2]
```

This variable can be used to access information about the object. The following is the x coordinate of the start point of *Line[2]*.

```
$t.start.x
```

## Comparing variables

Comparing variables lets you check information. They also allow you to decide the course of action to take in **if** and **while** commands. For further details, see:

- Making decisions in macros (see page 33)
- Repeating commands in macros (see page 39)

A result of a comparison is either *true* or *false*. When it is true, a value of **1** is output and when false, **0** is output.

A simple comparison may consist of two variables with one of the following operators between them:

<code>==</code>	is equal to
<code>!=</code>	is not equal to
<code>&lt;</code>	is less than
<code>&lt;=</code>	is less than or equal to
<code>&gt;</code>	is greater than
<code>&gt;=</code>	is greater than or equal to

For example:

```
LET $C = ($A == $B)
```

`C` is true if `A` equals `B` and is assigned **1**. If `A` doesn't equal `B`, then `C` is false and assigned **0**.



*The variables `=` and `==` are different. The single equal sign `=` means to assign a value, whereas the double equals sign `==` means compare two values for equality.*

If you compare the type of an object with a text string, you must use the correct capitalisation. For example, if you want to check that `selection.type[0]` is a composite curve, you must use:

```
selection.type[0] == 'Composite Curve'
```

and not:

```
selection.type[0] == 'Composite curve'  
selection.type[0] == 'composite curve'
```

For example:

```
LET $e = (($a+$b) >= ($c+$d))
```

If you are carrying out a command that you are certain does not expect a number, you can use:

```
TYPE $variable = expression
```

where `type` is **INT**, **REAL**, or **STRING**

You can also use:

```
$variable = expression
```

For example, you must use `LET` in the following:

```
create line
LET start_x = 10
LET start_y = 20
LET start_z = -50
$start_x $start_y $start_z
LET end_x = 20
LET end_y = 30
LET end_z = 50
$end_x $end_y $end_z
```



*If in doubt, include the `LET`.*

Logical operators let you do more than one comparison at a time.  
Logical operators are:

- `AND`
- `OR`
- `NOT`



*Remember that **true = 1** and **false = 0***

### **AND (&)**

This outputs **1** if both inputs are 1.

```
0 & 0 outputs a value 0
0 & 1 outputs a value 0
1 & 0 outputs a value 0
1 & 1 outputs a value 1
```

Examples of the logical operator `AND`:

```
(5 == 2+3) & (10 == 3 * 3) = 0, since (5 == 2+3) is true but
(10 == 3 * 3) is not.
```

```
(10 == 2*5) & (CONCAT('abc';'xyz') == 'abcxyz') = 1, since
both are true.
```

### **NOT (!)**

This outputs the inverse of the input.

```
!1 outputs a value 0
!0 outputs a value 1
```

Examples of the logical operator `NOT`:

```
!(17 == 10+7) = 0, since (17 == 10+7) is true.
```

```
!(19*100 > 2000 ) = 1, since (19*100 > 2000 ) is false.
```

### **OR (|)**

This outputs 1 if either input is 1 or if both are 1.

```
0 | 0 outputs a value 0
0 | 1 outputs a value 1
1 | 0 outputs a value 1
1 | 1 outputs a value 1
```

Examples of the logical operator **OR**:

```
(5 == 2+3) | (10 <= 3*3) =1, since (5 == 2+3) is true.
```

```
(11 == 2*5) | (CONCAT('abc';'xyz') == 'hello') = 0, since
both are false.
```

## Using expressions in macros

An expression is a list of variables and values with operators, which specify a value. In the following example the operators are **+**, **\***, **sine()** and **-**.

```
(5+6)*10
sine(60)
$size-10
```

You can use an expression:

- to assign a value to a variable
- to print out its value
- in another command

For example:

To assign a value to a variable:

```
LET $result = (5+6)*10
```

Variable *\$result* is assigned the value 110.

To print the value of an expression:

```
PRINT sin(30)
```

0.500000 is displayed in the Command window.

To use an expression in another command:

```
SELECT ADD ARC 'my_arc'
MODIFY
RADIUS $size * 7
```



*You cannot mix numeric and string variable types within an expression.*

For each variable type, the operators perform various tasks.

- Operators for integers and real numbers (see page 29)
- Operators for strings (see page 31)
- Operators for lists (see page 31)
- Operators for vectors (see page 31)
- Comparison operators (see page 32)
- Logical operators (see page 33)
- Variable for arc tangent (see page 33)



*Spaces may be included on each side of the operators.*

## Operators for integers and real numbers

Use the following operators for integers and real numbers:

+	addition
-	subtraction
*	multiplication
/	division
%	modulus; the remainder after two integers are divided; for example, $11\%3 = 2$
^	power of; for example, $2^3 = 2 * 2 * 2 = 8$
<code>sin( )</code>	sine of an angle
<code>cos( )</code>	cosine of an angle
<code>tan( )</code>	tangent of an angle
<code>atan( )</code>	angle whose tangent is equal to the given value
<code>acos( )</code>	angle whose cosine is equal to the given value
<code>asin( )</code>	angle whose sine is equal to the given value
<code>abs( )</code>	absolute value of a number (removes any minus signs); for example, $\text{absolute}(-56.98) = 56.98 = \text{absolute}(56.98)$

<code>sqrt( )</code>	square root of a number; for example, $\text{sqrt}(81) = 9$
<code>log( )</code>	output the natural logarithm of a number; for example, $y = \text{logarithm}(7.389056) = 2$
<code>exp( )</code>	outputs the exponential value of a number with respect to $e$ , the base of the natural logarithms; for example, $y = \text{exp}(2) = e^2 = 7.389056$
<code>min(A1; A2; ... ; AN)</code>	outputs the minimum value of the list of numbers
<code>max(A1; A2; ... ; AN)</code>	outputs the maximum value of the list of numbers
<code>compare (A; B; C)</code>	outputs 1 if A and B are equal within tolerance value C and 0 otherwise
<code>test ? result_true : result_false</code>	if <i>test</i> is true then <i>result_true</i> is assigned to the variable otherwise <i>result_false</i> is assigned

For example:

```
LET $x = $a>=$b ? $a+$b : $a-$b
```

This assigns  $a+b$  to  $x$  if  $a \geq b$  and assigns  $a-b$  to  $x$  if  $a < b$ .



## Operators for strings

Use the following operators on strings:

<code>length( )</code>	outputs the number of items in a string
<code>concat(string1; string2; ... ; stringN)</code>	outputs a single string which is a combination of all the other strings

For example:

```
LET $name = 'Fred'
LET $greeting = concatenate ('Hello ' ; $name)
PRINT $greeting
```

In the Command window, this outputs the following

**Hello Fred**



*The operators work with strings, integers and real numbers*

## Operators for lists

A list is represented as  $\{a; b; c; \dots\}$ . The operators for lists are:

<code>{a; b; c; ...}[n]</code>	outputs the $n$ th element of the list
<code>length({a; b; c; ...})</code>	number of items in the list
<code>concat({a1; a2; ...; an}; {...}; ... ; {...})</code>	outputs all the elements in the lists as a single list

## Operators for vectors

Use the following operators on vectors, where **A** equals vector  $[x;y;z]$  and **B** equals  $[a;b;c]$ .

**modulus(A)**

This outputs the magnitude of the vector and is calculated as  $\sqrt{(x*x)+(y*y)+(z*z)}$ . For example:

```
// define tolerance
LET $tol = 0.00001

// find the length of this vector
// (note: could use length($vec))
LET $dist = modulus(line[1].end - line[2].start)
```

```
// test if length is less than tolerance
LET $coinc = $dist < $tol

// if true, the two points are coincident
if $coinc {
print "End of line coincident with second line."
}
```

### **normal (A)**

This outputs the unit vector of vector A. The unit vector has the same direction as vector A, but its modulus is 1.

```
// angle between line 1 and the x-axis,
LET $cosine=normal(line[1].end-line[1].start).[1;0;0]
LET $angle = acos( $cosine )

print "Angle between line 1 and the x axis is,"
print $angle
```

### **length(A)**

This is the same as modulus.

### **(A) . (B)**

This outputs the dot product of two vectors. The dot product is calculated as  $((x*a)+(y*b)+(z*c))$ .

### **cross()**

This outputs the cross product of two vectors. This is the vector that is perpendicular to the two vectors. For example, the cross product of the X and Y axes is the Z axis.

```
print cross([1;0;0]; [0;1;0])
returns [0;0;1]
```

## **Comparison operators**

Use these operators to compare two given values **A** and **B**.

<code>A == B</code>	outputs 1 if A equals B and 0 otherwise
<code>A != B</code>	outputs 1 if A does not equal B and 0 otherwise
<code>A &lt; B</code>	outputs 1 if A is less than B and 0 otherwise
<code>A &lt;= B</code>	outputs 1 if A is less or equal to B and 0 otherwise
<code>A &gt; B</code>	outputs 1 if A is greater than B and 0 otherwise
<code>A &gt;= B</code>	outputs 1 if A is greater or equal to B and 0 otherwise

## Logical operators

Use the logical operators to compare expressions and variables:

<code>A &amp; B</code>	outputs 1 if A and B are true and 0 otherwise. This is known as the <b>AND</b> operator
<code>A   B</code>	outputs 1 if either A or B is true and 0 otherwise. This is known as the <b>OR</b> operator
<code>! A</code>	outputs 1 if A is false and 0 if true. This is known as the <b>NOT</b> operator

## Arc tangent

Use the following variable to calculate the arc tangent:

```
atan2(arg1;arg2)
```

This is useful for finding the azimuth and elevation for a unit vector  
`[i; j; k]`

```
let azimuth = atan2(j; i)  
let elevation = asin(k)
```

## Making decisions in macros

The `IF` (see page 34) command enables you to choose which commands are carried out next depending on the value of a variable.

If you ask the user to enter a number for the lateral they want to move, you do not know what value the user will enter. You can use a comparison to verify that the value that is entered is valid:

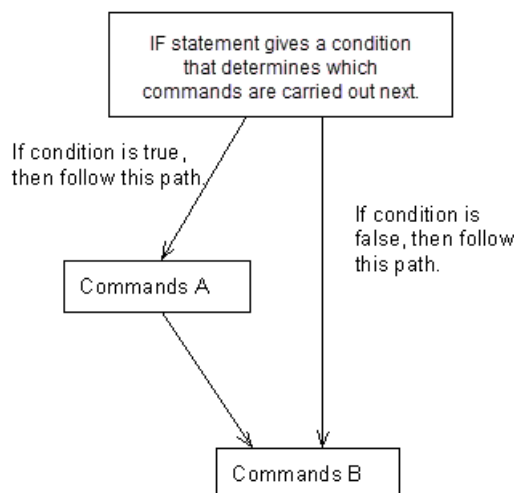
- if the value is valid, continue with the operation on the lateral.
- if the value is invalid, tell the user that their input is invalid and ask them to enter another value.

## IF

When a condition is met, the **IF** command can be used to execute a series of commands.

```
$variable = (condition)
IF $variable {
    Commands A
}
Commands B
```

If the conditional test after **IF** is true then *Commands A* are executed followed by *Commands B*. If the test is false, then only *Commands B* are executed.



You must enclose *Commands A* in brackets **{ }** and the brackets must be positioned correctly. The following command is *not* valid:

```
LET $invalid = ($radius == 3)
IF $invalid PRINT "Invalid radius"
```

To make this command valid, add the brackets as follows:

```
LET $invalid = ($radius == 3)
IF $invalid {
    PRINT "Invalid radius"
}
```



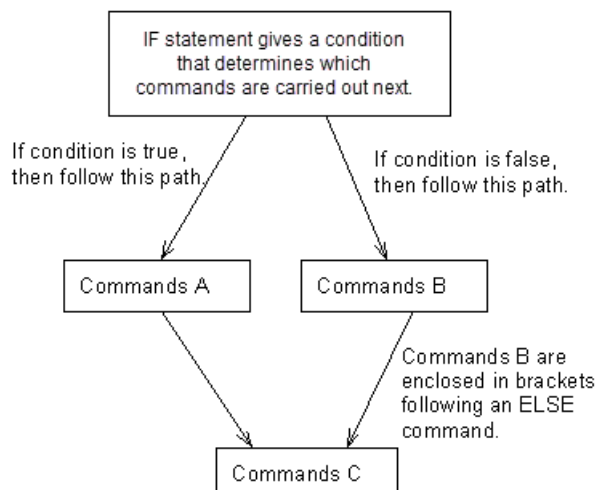
*The first bracket must be the last item on the line and on the same line as the **IF**. The closing bracket must be on a line by itself.*

You can also specify commands that are performed only when the condition is *false*. These commands are specified using the **IF-ELSE** (see page 35) and **IF-ELSEIF-ELSE** (see page 35) commands.

## IF-ELSE

```
IF $condition {  
    Commands A  
} ELSE {  
    Commands B  
}  
Commands C
```

If the conditional test after `IF` is true, then *Commands A* are executed followed by *Commands C*. If the conditional test fails, then *Commands B* are executed followed by *Commands C*.



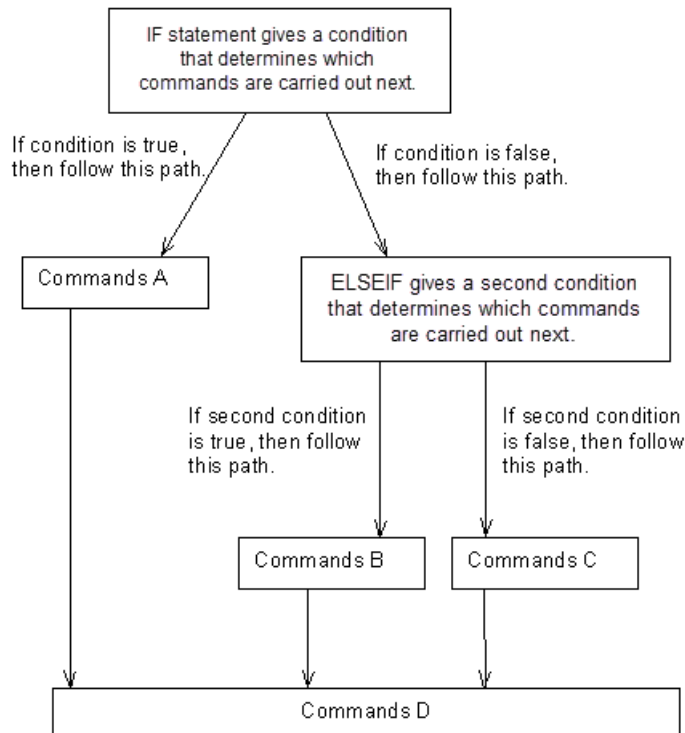
## IF - ELSEIF - ELSE

```
IF $condition_1 {  
    Commands A  
} ELSEIF $condition_2 {  
    Commands B  
} ELSE {  
    Commands C  
}  
Commands D
```

The above construct works as follows:

- If `condition_1` is true, then *Commands A* are executed followed by *Commands D*.
- If `condition_1` is false and `condition_2` is true, then *Commands B* are executed followed by *Commands D*.

- If `condition_1` is false and `condition_2` is false, then *Commands C* are executed followed by *Commands D*.



*ELSE* is an optional command. There can be any number of *ELSEIF* statements in a block, but not more than one *ELSE*. *ELSEIF* can be written as one word or as *ELSE IF*.

You can perform tests directly in *if* and *elseif* commands. So,

```

let e1 = $error == 1
let e2 = $error == 2
if e1 {
print e1
} elseif e2 {
print e2
}
  
```

can also be written as:

```

if ($error == 1) {
print e1
} elseif ($error == 2) {
print e2
}
  
```

## Switch

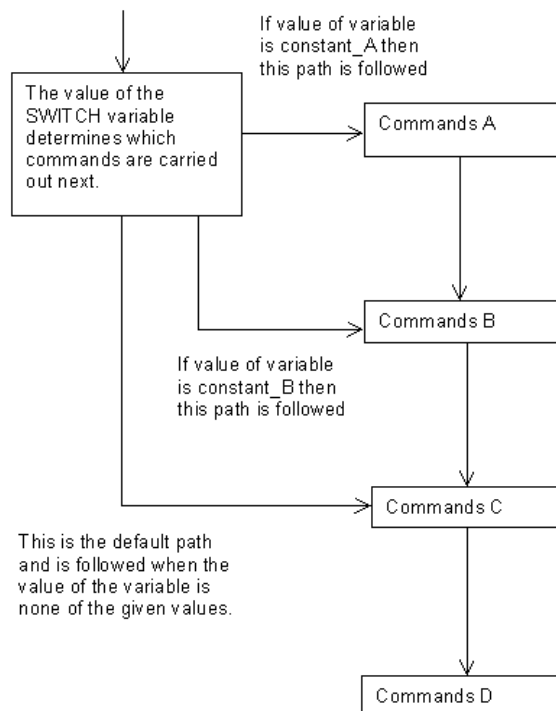
When you compare a variable with a number of possible values and each value determines a different outcome, it is recommended that you use the `SWITCH` command (see page 100).

The `SWITCH` statement allows you to define a variable which is compared against a list of possible values. This comparison determines which commands are executed.

```
switch $variable {  
  case (constant_A)  
    Commands A  
  case (constant_B)  
    Commands B  
  default  
    Commands C  
}  
Commands D
```

This construct works as follows:

- if variable = `constant_A`, then *Commands A, B, C and D* are executed.
- if variable = `constant_B`, then *Commands B, C and D* are executed.
- if no match is made, then *Commands C and D* are executed.

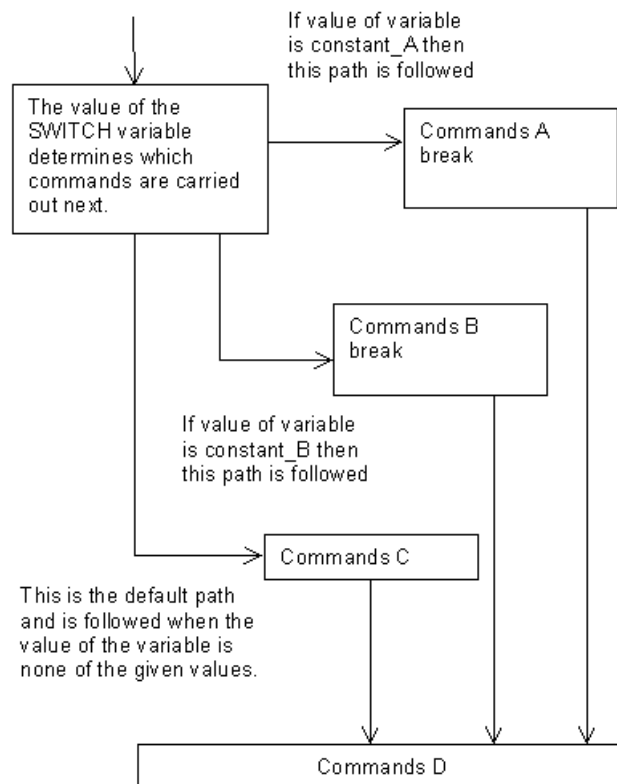


The commands are executed through the **switch** command. When a match is found, all the commands in the remaining **case** statements are executed. You may prevent this from happening by using a **break** statement:

```
switch $variable {  
  case (constant_A)  
    Commands A  
    break  
  case (constant_B)  
    Commands B  
    break  
  default  
    Commands C  
}  
Commands D
```

This construct works as follows:

- if variable = `constant_A`, then *Commands A and D* are executed.
- if variable = `constant_B`, then *Commands B and D* are executed.
- if no match is made, then *Commands C and D* are executed.



*There may be any number of **case** statements, but only one **default** statement.*



## Repeating commands in macros

It is useful to repeat a command a number of times, for example, creating a circle at the start of every line in the model.

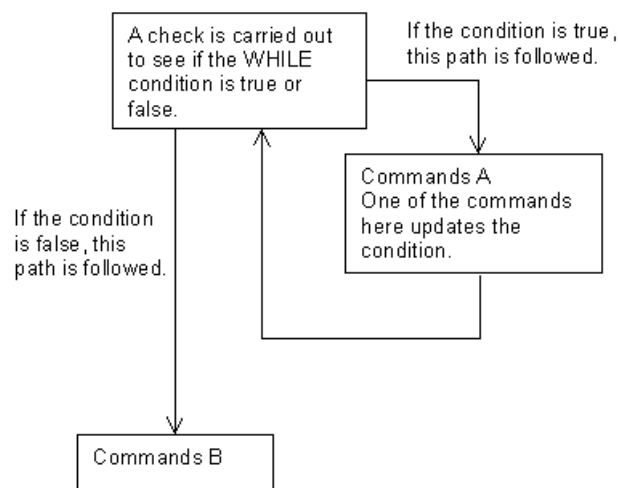
Commands that allow you to repeat commands are known as *loops*. There are two loop structures; the WHILE loop and the DO - WHILE loop.

A **WHILE** loop repeatedly executes a block of commands until its conditional test is false.

```
WHILE $condition {  
    Commands A  
}  
Commands B
```

The construct works as follows:

- 1 If the conditional test after **WHILE** is true, then *Commands A* are executed and the conditional test repeated.
- 2 When the conditional test is false, *Commands A* are no longer executed and the program executes *Commands B*.



Within **WHILE** loops, you can jump to the end of the block of commands to:

- cancel the loop using the **BREAK** command
- continue with the next iteration using the **CONTINUE** command.

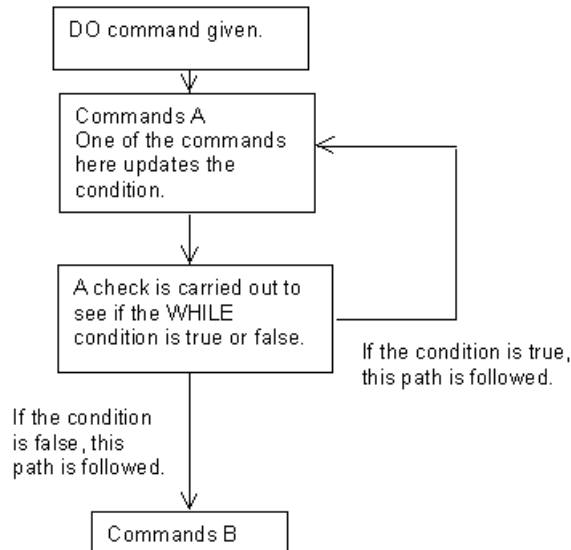
The **WHILE** loop checks its conditional test first to decide whether to perform its commands, by contrast, the **DO-WHILE** loop performs its commands and then checks whether to repeat.

```
DO {  
    Commands A  
} WHILE $condition
```

## Commands B

This construct works as follows:

- 1 *Commands A* are executed, and if the conditional test after `WHILE` is true *Commands A* are repeated.
- 2 When the conditional test is false, *Commands A* are no longer executed and the program executes *Commands B*.



Within `DO` loops, you can jump to the end of the block of commands to:

- cancel the loop using the `BREAK` command
- continue with the next iteration using the `CONTINUE` command.

## CONTINUE

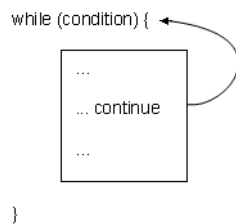
`CONTINUE` causes a jump to the conditional test of any one of the loop constructs `WHILE` and `DO-WHILE` in which it is encountered, and starts the next iteration, if any.

An example is given below.

```
LET $a = 1
WHILE $a {
  INPUT NUMBER 'Input number of holes' $Holes
  LET $zerotest = ($Holes <= 0)
  IF $zerotest {
    Print "***Invalid input***"
    Print "Input must be greater than zero"
    CONTINUE
  }
  LET $a = 0
  LET $angle = (360/$Holes)
}
```

## Example

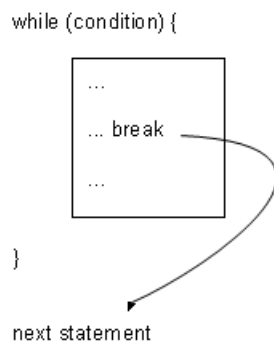
The user is asked to enter the number of holes. Before the calculation, you need to make sure that the number is valid. Using the `CONTINUE` command allows the user to enter the value again.



## BREAK

`BREAK` causes a jump to the statement beyond the end of any one of the constructs `WHILE`, `DO-WHILE`, `SWITCH` in which it is encountered.

Nested constructs can require multiple breaks.



## Jumping from one point in the macro to another

The `GOTO` command (see page 42) is used in conjunction with a label (see page 43). This construct:

- lets you jump from one point in a macro to another.
- is used mainly used with error checking; if an invalid condition is met, the macro file can be made to jump to an error message.

## GOTO

The `GOTO` string causes a jump to the commands following a label (see page 43):

The following rules specify the use of `GOTO`:

- The destination label must be in the same macro as the `GOTO`.
- Jumps may be made forwards or backwards within the macro.
- Jumps may occur out of constructs (for example, out of an `IF-ELSE`, or `WHILE` block).
- Jumps may not be into constructs.
- If a jump is made out of a construct, the construct is cancelled appropriately.

`GOTO` makes a macro more difficult to follow and should be avoided where possible. However, `GOTO` can be used to make your macro clearer if used only as a forward jump, for example:

- to the end of a macro
- to lines near the end for printing error messages.

For example:

The following example shows how `GOTO` can be used. However it is better practice to use a loop instead of the `GOTO` command.

```
GOTO :input
// This jumps to the line in macro which looks like:
// :input
// :input is the label command that defines where the
// goto jumps to.
:input
INPUT NUMBER "Lateral point number" $num
LET $test=(1>$num)|($num>surface[1].lateral[1].number)
IF $test {
    GOTO Error1
}
.
.
.
return

//Error messages
:Error1
PRINT '**A lateral must have more than 1 point.**'
GOTO input
```

The previous example could be written more clearly by using a `WHILE` loop to check the condition `$test`.

```
INPUT NUMBER "Lateral point number" $num
LET $test=(1>$num)|($num>surface[1].lateral[1].number)
WHILE $test {
  PRINT '**A lateral must have more than 1 point.**'
  INPUT NUMBER "Lateral point number" $num
  LET $test=(1>$num)|($num>surface[1].lateral[1].number)
}
.
.
return
```

## Labels

Labels are used in conjunction with the `GOTO` command to control progression through the macro.

Use a label as follows:

- At the beginning of any line in a macro file. They are alphanumeric prefixed with a colon `:`. For example:

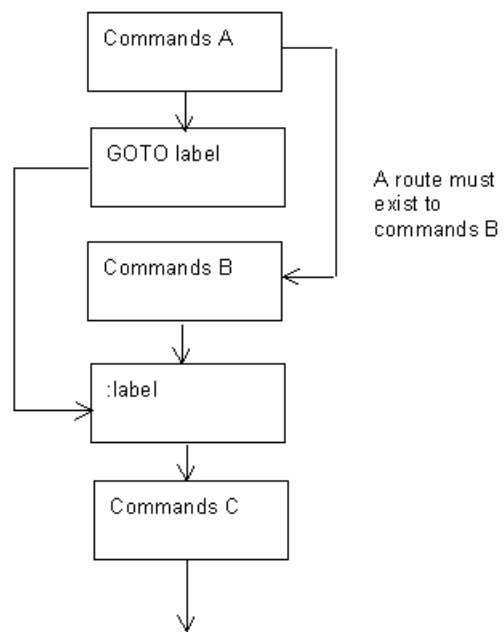
```
:draw
```

The first non-space character defines the label, all other text is ignored. If text is added after the label it is treated as a comment. For example:

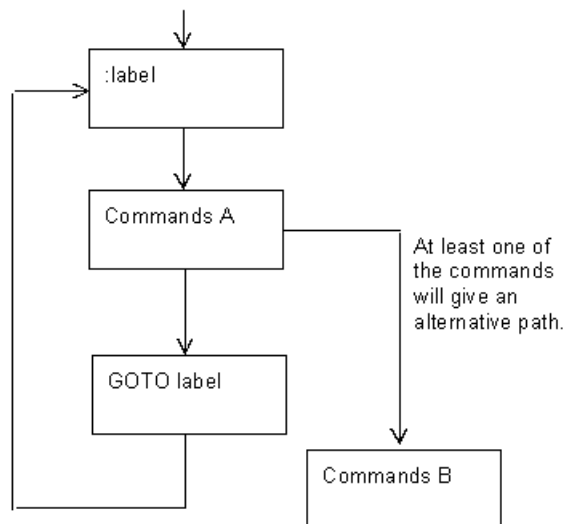
```
:draw This text is a comment
```

- To jump forwards or backwards in the file to a position marked with a label.
- In macro files; it cannot be used as a typed command in the Command window.

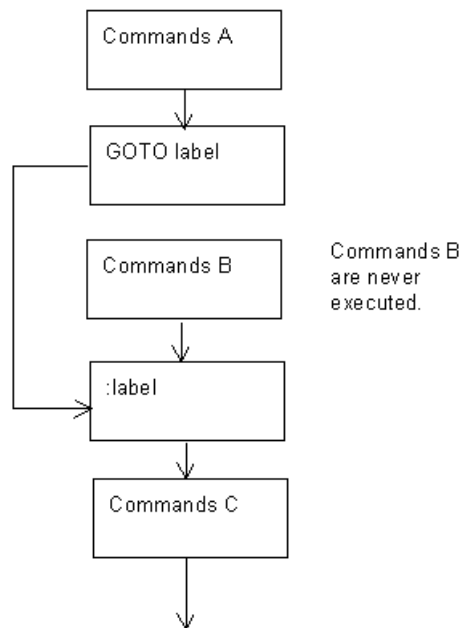
- After a **GOTO** command:



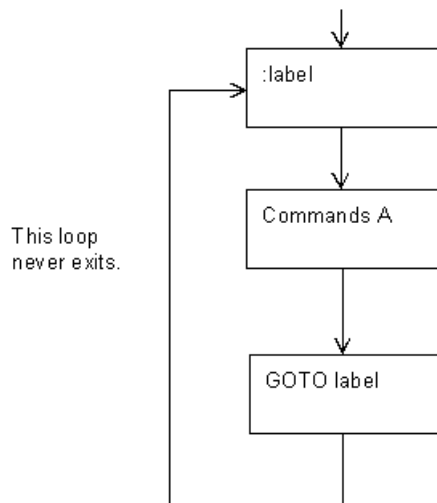
- Before a **GOTO** command



**NOTE:** *Ensure that a path exists to all the commands in the macro; otherwise you will have commands which are not used:*



Ensure that you do not create an infinite loop (that is a loop in the macro which never exits):



## Defining a path to a directory in a macro

Use path commands to define directories where a macro looks for information when it is run. These commands can be used to set the directory path inside a macro when:

- importing files
- opening models
- running macros

The following commands are available:

<code>PATH DELETE</code>	deletes a single path
<code>PATH DELETEALL</code>	deletes all pre-defined paths to directories
<code>PATH ADD BACK</code>	creates a new path to a directory
<code>PATH LIST</code>	lists the paths (in the Command window)
<code>PATH QUIT</code>	quits the path commands

The following example shows how to run several macros from within another macro. The macros are stored in `C:\Documents and Settings\xxx\My Documents`.

```
PATH DELETEALL
PATH ADD BACK 'C:\Documents and Settings\xxx\My
Documents'
PATH LIST

MACRO RUN 'test1.mac'
MACRO RUN 'test2.mac'
MACRO RUN 'test3.mac'
```

## Running a macro in another macro

You can embed an existing, tested, macro inside a new macro. This saves time on testing and repeating commands.

The command to run a macro from within a macro is:

```
MACRO RUN pathname_of_macro
```



*If the name of a macro file contains spaces, the name must be included in double quotes. For example,*

```
macro run "name of file.mac"
```

When you initiate a macro from a running macro, you can also pass values into the macro. The command to do this is described in [Entering values during macro initiation](#) (see page 14).

You can also pass expressions as arguments in the command line to run a macro from another macro. The result of the expression must be real.

```
macro run create_block.mac $length ($Length/2)
(2*$Length)
```

If one of the arguments in the command is a variable or an expression, or you have a negative number, you must take care with the use of brackets.

If you run the macro with the arguments

```
10 ($bob) -1
```



10 will be allocated to `$length`

`($bob) -1` will be evaluated and assigned to the second argument. This leaves nothing to be assigned to the third variable. So, only two sides of the block will have lengths assigned to them.

To allocate all three arguments, the correct use of brackets should be:

```
10 ($bob) (-1)
```



*To make certain of the correct use of brackets, you can use brackets around the individual arguments at run time.*

## Exporting variables from a macro

You can export variables from a running macro. The command is:

```
EXPORT $variable_name
```

If the macro is running from within another macro, a variable of that name is either modified or created.

The following example shows how to pass values into a macro and export from one macro to another.

**Macro1** has the following code in it:

```
LET $a = 50
LET $b = 100
LET $c = 200
```

```
MACRO RUN Macro2.mac $a $b $c
```

```
PRINT $a
PRINT $b
PRINT $c
```

```
PRINT $d
PRINT $e
PRINT $f
```

**Macro2** has the following code:

```
ARGS{
INT a
INT b
INT c
}
```

```
LET $d = $a / 2
LET $e = $b / 2
LET $f = $c / 2
```

```
EXPORT $d
```

```
EXPORT $e  
EXPORT $f
```

The result as shown in the Command window would be:

```
50  
100  
200  
25  
50  
100
```

You also see the following warning:

### **Warning variable created**

This means that the three variables that were exported from **Macro2** have been created in **Macro1** so that they can be printed.

### **Exporting file names**

You can use the following macro command to pad out file export names in macros.

```
PADLEADING
```

The example below fills the variable *padded* with *00010*. This creates a string of width 5 containing the given string value *\$s* where the variable *s* = *10* padded with leading 0s.

```
string padded = PADLEADING($s; 5; '0')
```



*This macro command cannot be used with print commands.*

## **Stepping from within a macro**

You can step commands in a macro while the macro is running.

To enable stepping mode from within a macro, use the command:

```
EXECUTE STEP
```

To disable stepping mode, use:

```
EXECUTE RUN
```

When the command `EXECUTE STEP` is processed, the commands that follow it are stepped until the macro finishes or the command `EXECUTE RUN` is reached.

## Pausing a macro

A pause temporarily stops a running macro. There are two types of pauses you can add to a macro:

- a pause that lasts a predefined number of seconds
- a pause that waits for the user to press a button to continue the macro.

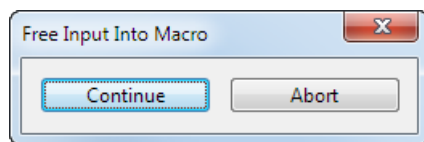
If you pause a macro for a set number of seconds, after this period of time, the macro continues automatically. This command is useful when macros run too quickly for you to see what is happening to your model. By pausing the macro for a few seconds, you can see how the macro is operating on your model.

The command is:

```
EXECUTE PAUSE integer
```

where *integer* is the number of seconds you wish to pause the macro.

Use the `INPUT FREE` command to pause a macro indefinitely and display a dialog:



Click **Continue** to continue running the macro.

Click **Abort** to terminate the macro.



*While the macro is paused, you can make changes to your model and then continue running the macro.*

## Ending a macro

A macro ends in the following cases:

- when it reaches its last command.
- when it executes a `RETURN` command.

## Useful curve commands

To add a curve at a keypoint:

```
ADD CURVE fred AT KEYPOINT 2
```

If the keypoint does not exist, nothing happens

To add a composite curve:

```
ADD COMPCURVE fred AT COMPOSITE 3 KEYPOINT 5
```

If the keypoint does not exist, nothing happens

To make a span of a curve invisible,

```
SPAN_INVISIBLE span_number/point_index curve_id  
DISPLAY REBUILD
```

To make a span of a curve visible,

```
SPAN_VISIBLE span_number/point_index curve_id  
DISPLAY REBUILD
```

Use the following commands to control the display of the bad trimming dialog when exporting:

```
EXPORTOPTS IGNOREBADTRIMON supresses the dialog.
```

```
EXPORTOPTS IGNOREBADTRIMOFF displays the message dialog
```

## **Skipping command lines**

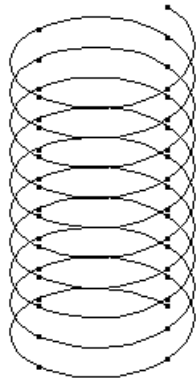
In addition to stepping commands, you can also skip blocks of commands. This is done using the `SKIP` command. The following command causes 17 lines to be skipped:

```
SKIP 17
```

---

# Helix macro tutorial

This example describes how to generate a macro to create a helix.



We suggest you complete this example before attempting to create your own macros.

While creating the helix macro, you edit a macro file to make changes to it. You can edit your own file or run a stored file. The stored files are in the following folder:

`C:\Program Files\Autodesk\PowerShapexxxxx\file\examples\Macro_Writing`

where `xxxxx` is the version number of PowerShape and C is the disk on which PowerShape is installed.

## Recording and viewing the helix macro

We will record a macro to create the first turn of the helix. By recording the macro, you can find the commands to use in your macro. When you have the basic commands, you can enhance your macro.

- 1 Open the model in which you want to create the helix
- 2 Select Home tab > Macro panel > Record. The **Record Macro** dialog is displayed.
- 3 Browse to the folder, where you want to save the macro file.
- 4 In the **File name** box, type `helix_turn`
- 5 Click **Save** to close the dialog and start creating the macro.
- 6 Select Wireframe tab > Create panel > Curve > Bezier. This ensures that the **Curve** option is selected when you run the macro.

- 7 Type in the coordinates of the points of the curve in the graphics window:

**10 0 0**

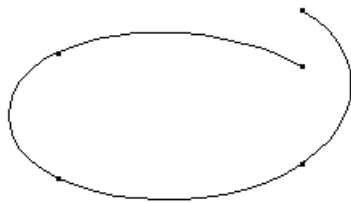
**-10 10 1**

**-10 -10 1**

**10 -10 1**

**10 10 1**

This creates a spiral shape.



- 8 On the Quick Access toolbar, click  to exit curve creation.
- 9 Select Home tab > Macro panel > Record to stop recording.
- 10 Open the macro in a text editor, such as **Notepad**. The macro should look as follows:

The first command tells the software to enter curve creation mode:

**CREATE CURVE**

The second command selects the Curve option from Wireframe tab > Create panel > Curve:

**THROUGH**

The third command inputs the co-ordinates of the points on the curve:

**10 0 0**

**-10 10 1**

**-10 -10 1**

**10 -10 1**

**10 10 1**

The final command exits curve creation mode and goes back to selection mode:

**Select**

If you want to use the helix macro to create threads in your models, a more appropriate macro to use is **helix.mac**, available in:

C:\Program Files\Autodesk\PowerShapexxxx\file\examples\Macro\_Writing  
where **xxxxx** is the version number of PowerShape and C is the disk  
on which PowerShape is installed.

For further details, see Running the macro (see page 53).

## Running the macro

You can run a macro many times to perform the same task. This saves you time, because you do not have to enter each command individually in the task.

To run your macro file:

- 1 Delete the curve in your model.
- 2 Select Home tab > Macro panel > Macro > Run. The **Run Macro** dialog is displayed.
- 3 Select your macro file.
- 4 Click **Open**.

## Editing the macro

This example shows how to edit the macro to create a helix with radius **50** and the distance between each turn (pitch) **20**.

- 1 Open your macro file in a text editor.
- 2 Edit the coordinates in your macro to:  
**50 0 0**  
**-50 50 5**  
**-50 -50 5**  
**50 -50 5**  
**50 50 5**
- 3 Save the file.
- 4 Select Home tab > Macro panel > Macro > Run to display the **Run Macro** dialog.
- 5 Select your macro file.
- 6 Click **Open** to create the helix.

## Adding variables

You may want to create a helix using different values. This topic shows you how change the values in the macro to use variables.

The macro then creates a helix using the following variables:

- radius, which is set to 10
- pitch (the length between each turn) which is set to 4

You can:

- Edit your macro file
- Open and examine the file *helix\_variable.mac* in the folder:

C:\Program  
Files\Autodesk\PowerShapexxxxx\file\examples\Macro\_Writing

where **xxxxx** is the version number of PowerShape and C is the disk on which PowerShape is installed.

The changes are given in black text.

**LET \$radius = 10**

**LET \$pitch = 4**

**LET \$neg\_radius = -\$radius**

**LET \$zheight = \$pitch / 4**

**create curve**

**THROUGH**

**\$radius 0 0**

**\$neg\_radius \$radius \$zheight**

**\$neg\_radius \$neg\_radius \$zheight**

**\$radius \$neg\_radius \$zheight**

**\$radius \$radius \$zheight**

**Select**

The **LET** commands assign values. For example, the following command assigns 10 to *variable* \$radius.

**LET \$radius = 10**

For each coordinate, the value is replaced by a single variable. For example:

**-50 50 5**

becomes:



### **\$neg\_radius \$radius \$zheight**

This makes it easier to change the values. Instead of changing all the coordinates each time you want to create a different size helix, you can now assign new values to the variables.

There are different variables for the negative and positive radius. The coordinate of each point in the curve is of the form:

### **x\_value y\_value z\_value**

where the values are either numbers or single variables. If you want to use expressions for positions in your macro, you must use the following:

### **POSITION**

**X** expression\_for\_x

**Y** expression\_for\_y

**Z** expression\_for\_z

### **ACCEPT**

where each expression is a valid expression in PowerShape's macro language.

To run the macro that includes variables:

- 1 Select Home tab > Macro panel > Macro > Run. The **Run Macro** dialog is displayed.
- 2 Select your macro file or *helix\_variable.mac*. For further details see, Running the macro (see page 53).
- 3 Click **Open** to create the helix.

To change the values of the radius and pitch, open the macro file and edit the values in the macro. This saves time changing all the coordinate values.

For further details, see Using expressions in macros (see page 28).

## **Adding a loop**

We want the helix to turn 10 times. To do this, we add a **while** loop.

You can:

- Edit your macro file
- Open and examine the file *helix\_variable.mac* in the folder:

C:\Program

Files\Autodesk\PowerShapexxxx\file\examples\Macro\_Writing

where **xxxxx** is the version number of PowerShape and C is the disk on which PowerShape is installed.

The changes are given in black text.

```
LET $radius = 10  
LET $pitch = 4  
LET $numturn = 10  
LET $neg_radius = -$radius  
LET $zheight = $pitch / 4  
create curve  
THROUGH  
$radius 0 0  
WHILE $numturn {  
LET numturn = $numturn - 1  
$neg_radius $radius $zheight  
$neg_radius $neg_radius $zheight  
$radius $neg_radius $zheight  
$radius $radius $zheight  
}  
Select
```

The variable `numturn` indicates how many times the helix turns. The following command assigns a value to this variable:

- **LET \$numturn = 10**

The value of `numturn` is also the condition of the **while** loop. You can read the **while** loop commands as:

- *While `numturn` does not equal zero, perform the commands in the brackets, { }.*

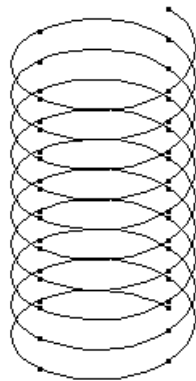
When the last bracket is reached, PowerShape checks `numturn`:

- If `numturn` does not equal zero, then the commands in the brackets { } are performed again.
- If `numturn` equal zero then the commands below the last bracket are carried out.

To run the macro that includes a loop:

- 1 Select Home tab > Macro panel > Macro > Run. The **Run Macro** dialog is displayed.
- 2 Select your macro file or *helix\_loop.mac*. For further details see, Running the macro (see page 53).
- 3 Click **Open**.

The helix turns 10 times:



You can change the value of numturn in the command:

**LET \$numturn = 10**

to make the helix turn a different number of times.

## Adding comments

You can add comments to your macro to remind you what each command does. Two slashes // are added at the start of a line to show it is a comment. You can also use blank lines to separate blocks of commands.

For example, when you add:

**// Calculating values for the co-ordinates**

The two slashes // indicate the line contains a comment. When you run a macro, PowerShape ignores any comment lines, so it behaves in the same way with or without comments added. The comments can remind you of what a block of commands does.

You can either:

- Edit your macro file
- Open and examine the file *helix\_variable.mac* in the folder:

**C:\Program**

**Files\Autodesk\PowerShapexxxx\file\examples\Macro\_Writing**

where **xxxxx** is the version number of PowerShape and C is the disk on which PowerShape is installed.

The changes are given in black text.

**// This macro creates a helix**

**// Written by: John Doe**

**// Values to change the size of the helix**

```

LET $radius = 10
LET $pitch = 4
LET $numturn = 10

// Calculating values for the co-ordinates
LET $neg_radius = -$radius
LET $zheight = $pitch / 4

// Creating the helix's curve
create curve
THROUGH

// The first co-ordinate
$radius 0 0

// Using a loop to input the
// co-ordinates for each turn
WHILE $numturn {
  LET numturn = $numturn - 1
  $neg_radius $radius $zheight
  $neg_radius $neg_radius $zheight
  $radius $neg_radius $zheight
  $radius $radius $zheight
}
// Exiting curve creation mode
Select

```

To run the macro that includes comments:

- 1 Select Home tab > Macro panel > Macro > Run. The **Run Macro** dialog is displayed.
- 2 Select your macro file or *helix\_comments.mac*. For further details see, Running the macro (see page 53).
- 3 Click **Open**.

The same helix is created as described in Adding a loop (see page 55).

## Interacting with the user

If you don't want to edit the macro each time you need to create a helix with a different size, you can display dialogs to request the values.

You can either:

- Edit your macro file
- Open and examine the file *helix\_variable.mac* in the folder:

C:\Program  
Files\Autodesk\PowerShapexxxxx\file\examples\Macro\_Writing

where *xxxxx* is the version number of PowerShape and C is the disk on which PowerShape is installed.

To edit your macro file:

- 1 Comment out the following commands in your macro.

**// LET \$radius = 10**

**// LET \$pitch = 4**

**// LET \$numturn = 10**

These commands will be replaced. However, you can leave the commands in your macros as comments, in case you want to use them again.

- 2 Add the following commands before the commands which are given in Step 1.

**// Displays dialogs to input values**

**INPUT NUMBER 'Radius of helix' \$radius**

**INPUT NUMBER 'Pitch (per turn)' \$pitch**

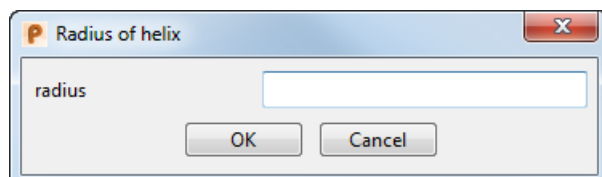
**INPUT NUMBER 'Number of turns' \$numturn**

The **INPUT NUMBER** command tells the user to input a number.

When the macro is run, the command:

**Input NUMBER 'Radius of helix' \$radius**

displays the dialog shown below:



The string '**Radius of helix**' is the title of the dialog. When the user enters a value, it is assigned to the variable *\$radius*. The name of the variable is on the left of the data box on the dialog.

To run the interactive macro:

- 1 Select Home tab > Macro panel > Macro > Run. The **Run Macro** dialog is displayed.
- 2 Select your macro file or *helix\_interact.mac*.
- 3 Click **Open**. The **Radius of helix** dialog is displayed.
- 4 Enter a value and click **OK**. The **Pitch** dialog is displayed.
- 5 Enter a value and click **OK**. The **Number of turns** dialog is displayed.
- 6 Enter a value and click **OK**. The values are inserted in the macro and the helix is drawn using the values.

## Changing the origin of the helix

In this example, the origin of the helix is the origin of the current workspace. We want to use any position as the origin.

We will add code so that the user can click a point on the screen to define the origin.

You can either:

- Edit your macro file
- Open and examine the file *helix\_variable.mac* in the folder:

C:\Program  
Files\Autodesk\PowerShapexxxxx\file\examples\Macro\_Writing

where *xxxxx* is the version number of PowerShape and C is the disk on which PowerShape is installed.

The changes are given in black text.

**// This macro creates a helix**

**// Written by: John Doe**

**// Displays dialogs to input values**

**INPUT POINT 'Position of centre' \$cenpos**

**INPUT NUMBER 'Radius of helix' \$radius**

**INPUT NUMBER 'Pitch (per turn)' \$pitch**

**INPUT NUMBER 'Number of turns' \$numturn**

```

// Values to change the size of the helix
// LET $radius = 10
// LET $pitch = 4
// LET $numturn = 10

// Calculating values for the co-ordinates
LET $neg_radius = -$radius
LET $zheight = $pitch / 4

// Creating the helix's curve
create curve
THROUGH

// The first co-ordinate
// $radius 0 0
LET start_x = $radius + $cenpos_x
LET start_y = $cenpos_y
LET start_z = $cenpos_z
$start_x $start_y $start_z

// Using a loop to input the
// co-ordinates for each turn
WHILE $numturn {
  LET numturn = $numturn - 1
  $neg_radius $radius $zheight
  $neg_radius $neg_radius $zheight
  $radius $neg_radius $zheight
  $radius $radius $zheight
}

// Exiting curve creation mode
Select

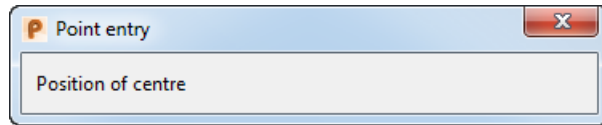
```

### Further information on changing the origin of the helix

The command:

**INPUT POINT 'Position of centre' \$cenpos**

displays the following dialog:



The dialog remains displayed on the screen until the user enters a point.

The point data is entered into the variable *\$cenpos*. You can obtain the x co-ordinate of the point using the variable *\$cenpos\_x*. Similarly, the y and z co-ordinates can be obtained.

The following commands enter the first point of the helix relative to the input position.

**LET start\_x = \$radius + \$cenpos\_x**

**LET start\_y = \$cenpos\_y**

**LET start\_z = \$cenpos\_z**

**\$start\_x \$start\_y \$start\_z**

To run the macro that changes the origin of the helix:

- 1 Select Home tab > Macro panel > Macro > Run. The **Run Macro** dialog is displayed.
- 2 Select your macro file or *helix\_origin.mac*.
- 3 Click **Open**. The **Point entry** dialog appears asking for you to input a position.
- 4 Click a point on the screen. The three dialogs are displayed as described in interacting with the user (see page 59).
- 5 Enter values in each dialog and click **OK**. The helix is drawn on the screen.

## Creating a helix around a cylinder

The helix is now constructed relative to a user-defined point. This topic describes how to extend the macro so the helix is constructed around an existing primitive cylinder (surface).

When the macro is running, the user selects the cylinder. The user is then asked:

- The number of turns to the helix
- The length of the pitch



The helix is drawn around the cylinder.

The macro also:

- Lets the user select the cylinder.
- Creates a temporary workplane at the workplane of the cylinder. The temporary workplane gives the centre of the helix and the orientation of the workplane.

You can either:

- Edit your macro file
- Open and examine the file *helix\_variable.mac* in the folder:

C:\Program  
Files\Autodesk\PowerShapexxxxx\file\examples\Macro\_Writing

where *xxxxx* is the version number of PowerShape and C is the disk on which PowerShape is installed.

The changes are given in black text.

**// This macro creates a helix**

**// Written by: John Doe**

**// Clear the selection list**

**SELECT CLEARLIST**

**// Selecting a cylinder**

**INPUT SELECTION 'Select a cylinder'**

**LET cyl = selection.object[0]**

**// Displays dialogs to input values**

**// INPUT POINT 'Position of centre' \$cenpos**

**// INPUT NUMBER 'Radius of helix' \$radius**

**INPUT NUMBER 'Pitch (per turn)' \$pitch**

**INPUT NUMBER 'Number of turns' \$numturn**

**// Values to change the size of the helix**

**// LET \$radius = 10**

**// LET \$pitch = 4**

**// LET \$numturn = 10**

```
//Creating a temporary workplane
CREATE WORKPLANE
$cyl.origin.x $cyl.origin.y $cyl.origin.z
```

```
// Modifying the workplane
```

```
MODIFY
NAME tmpwkhelix
XAXIS DIRECTION
X $cyl.xaxis.x
Y $cyl.xaxis.y
Z $cyl.xaxis.z
ACCEPT
YAXIS DIRECTION
X $cyl.yaxis.x
Y $cyl.yaxis.y
Z $cyl.yaxis.z
ACCEPT
ZAXIS DIRECTION
X $cyl.zaxis.x
Y $cyl.zaxis.y
Z $cyl.zaxis.z
ACCEPT
ACCEPT
```

```
    // Calculating values for the co-ordinates
    LET $radius = abs($cyl.lat[1].point[1].x)
    LET $neg_radius = -$radius
    LET $zheight = $pitch / 4
```

```
// Creating the helix's curve
create curve
THROUGH
```

```
// The first co-ordinate
$radius 0 0
// LET start_x = $radius + $cenpos_x
// LET start_y = $cenpos_y
// LET start_z = $cenpos_z
// $start_x $start_y $start_z
```

```
// Using a loop to input the
// co-ordinates for each turn
WHILE $numturn {
  LET numturn = $numturn - 1
  $neg_radius $radius $zheight
  $neg_radius $neg_radius $zheight
  $radius $neg_radius $zheight
  $radius $radius $zheight
}
```

```
// Exiting curve creation mode
// and deleting the temporary
// workplane
```

```
Select
SELECT CLEARLIST
SELECT ADD WORKPLANE 'tmpwkhelix'
DELETE
```

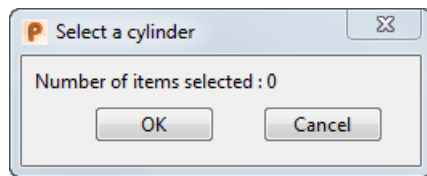
Before the cylinder is selected, we clear the selection list using the following command.

```
SELECT CLEARLIST
```

The command

```
INPUT SELECTION 'Select a cylinder'
```

displays the following dialog:



This dialog tells the user to select objects.

When the user clicks **OK**, your macro can get the details of what is selected by accessing the 'selection' object.

The following command assigns the first object in the selection to the variable *cyl*.

**LET cyl = selection.object[0]**

*selection.object[0]* is the first object in the selection. This object is assigned to variable *cyl*.

To find out more information about the selected object, you can use either:

- **selection.object[number].syntax**
- **cyl.syntax**

where syntax is the syntax associated with the selected object. For further details on the list of syntax for each object, see PowerShape object information (see page 142).

When you write macros, we advise you to assign the selected objects you want to use later in your macro to other variables. If the selection changes, you will obviously lose your selection.

For further details, see: Creating a workplane at the origin of the cylinder (see page 66)

## Creating a workplane at the origin of the cylinder

The following command creates a workplane at the origin of the cylinder.

**CREATE WORKPLANE**

**\$cyl.origin.x \$cyl.origin.y \$cyl.origin.z**

The variable *\$cyl* is the primitive cylinder. We have used the syntax of the primitive cylinder to find out its origin.

The commands below edit:

- the name of the workplane
- the direction of each axis of the workplane to match the axis on the instrumentation of the primitive.

**MODIFY**

```

NAME tmpwkhelix
XAXIS DIRECTION
X $cyl.xaxis.x
Y $cyl.xaxis.y
Z $cyl.xaxis.z
ACCEPT
YAXIS DIRECTION
X $cyl.yaxis.x
Y $cyl.yaxis.y
Z $cyl.yaxis.z
ACCEPT
ZAXIS DIRECTION
X $cyl.zaxis.x
Y $cyl.zaxis.y
Z $cyl.zaxis.z
ACCEPT
ACCEPT

```

The commands to use in your macro may not be obvious. You may need to:

- 1 Record a macro
- 2 Open the macro in a text editor
- 3 Copy the commands in your macro.

For example, to create and edit a workplane, record a macro to create a workplane, and then edit the properties you want to use in your macro.

The following command:

```
LET $radius = abs($cyl.lat[1].point[1].x)
```

uses the x co-ordinate of point 1 of lateral 1 of the cylinder to define the radius.

The command below uses the origin of the workplane to define the start point of the helix.

```
$radius 0 0
```

The following three lines clear the selection, then select and delete the workplane.

```
SELECT CLEARLIST
SELECT ADD WORKPLANE 'tmpwkhelix'
DELETE
```

## Adding user selection of the cylinder to the macro

You can either:

- Edit your macro file.
- Open and examine the file *helix\_variable.mac* in the folder:  
C:\Program  
Files\Autodesk\PowerShapexxxxx\file\examples\Macro\_Writing  
where *xxxxx* is the version number of PowerShape and C is the  
disk on which PowerShape is installed.

The changes are given in black text.

```
// This macro creates a helix
```

```
// Written by: John Doe
```

```
// Clear the selection list
```

```
SELECT CLEARLIST
```

```
// Selecting a cylinder
```

```
INPUT SELECTION 'Select a cylinder'
```

```
LET cyl = selection.object[0]
```

```
// Displays dialogs to input values
```

```
// INPUT POINT 'Position of centre' $cenpos
```

```
// INPUT NUMBER 'Radius of helix' $radius
```

```
INPUT NUMBER 'Pitch (per turn)' $pitch
```

```
INPUT NUMBER 'Number of turns' $numturn
```

```
// Values to change the size of the helix
```

```
// LET $radius = 10
```

```
// LET $pitch = 4
```

```
// LET $numturn = 10
```

```
//Creating a temporary workplane
CREATE WORKPLANE
$cyl.origin.x $cyl.origin.y $cyl.origin.z
```

```
// Modifying the workplane
```

```
MODIFY
NAME tmpwkhelix
XAXIS DIRECTION
X $cyl.xaxis.x
Y $cyl.xaxis.y
Z $cyl.xaxis.z
ACCEPT
YAXIS DIRECTION
X $cyl.yaxis.x
Y $cyl.yaxis.y
Z $cyl.yaxis.z
ACCEPT
ZAXIS DIRECTION
X $cyl.zaxis.x
Y $cyl.zaxis.y
Z $cyl.zaxis.z
ACCEPT
ACCEPT
```

```
    // Calculating values for the co-ordinates
    LET $radius = abs($cyl.lat[1].point[1].x)
    LET $neg_radius = -$radius
    LET $zheight = $pitch / 4
```

```
// Creating the helix's curve
create curve
THROUGH
```

```

// The first co-ordinate
$radius 0 0
// LET start_x = $radius + $cenpos_x
// LET start_y = $cenpos_y
// LET start_z = $cenpos_z
// $start_x $start_y $start_z

// Using a loop to input the
// co-ordinates for each turn
WHILE $numturn {
    LET numturn = $numturn - 1
    $neg_radius $radius $zheight
    $neg_radius $neg_radius $zheight
    $radius $neg_radius $zheight
    $radius $radius $zheight
}

// Exiting curve creation mode
// and deleting the temporary
// workplane

Select
SELECT CLEARLIST
SELECT ADD WORKPLANE 'tmpwkhelix'
DELETE

```

Before the cylinder is selected, clear the selection list using the following command.

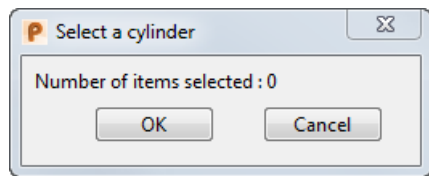
```
SELECT CLEARLIST
```

The command

```
INPUT SELECTION 'Select a cylinder'
```



displays the following dialog:



This dialog tells the user to select objects.

When the user clicks **OK**, your macro can get the details of what is selected by accessing the 'selection' object.

The following command assigns the first object in the selection to the variable *cyl*.

**LET cyl = selection.object[0]**

*selection.object[0]* is the first object in the selection. This object is assigned to variable *cyl*.

To find out more information about the selected object, you can use either:

- **selection.object[number].syntax**
- **cyl.syntax**

where *syntax* is the syntax associated with the selected object. For further details on the list of syntax for each object, see PowerShape object information (see page 142).

When you write macros, we advise you to assign the selected objects you want to use later in your macro to other variables. If the selection changes, you will lose your selection.

For further details, see: Creating a workplane at the origin of the cylinder (see page 66)

## Run your macro that creates a helix around a cylinder

To create a helix around a cylinder:

- 1 Create a primitive cylinder (surface).
- 2 Select Home tab > Macro panel > Macro > Run. The **Run Macro** dialog is displayed.
- 3 Select your macro file or *helix\_cyl.mac*.
- 4 Click **Open**. The **Select a cylinder** dialog is displayed.
- 5 Select the primitive cylinder.
- 6 Click **Accept**.

Two dialogs are displayed, asking for the *pitch* and the *number of turns*.

- 7 Enter values in each dialog and click **Accept**.

The helix is drawn around the cylinder.

## Testing input data

Many macros fail because the input data is wrong. To make sure that the correct data is input, you can test the data. If the wrong data is entered, prompt the user to input the data again.

The macro checks:

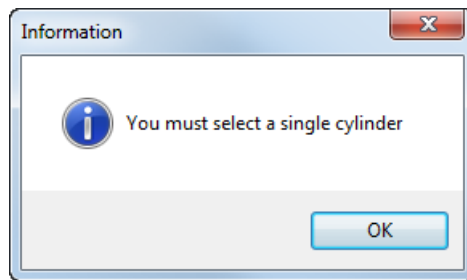
- if a single object is selected
- if the single object is a surface
- if the surface is a cylinder

If none of the above are true, the user is prompted that a single cylinder must be selected and then given an option to exit the macro. If the user decides to continue, they are asked to select a cylinder again. The macro also checks if the helix is smaller or larger than the cylinder.

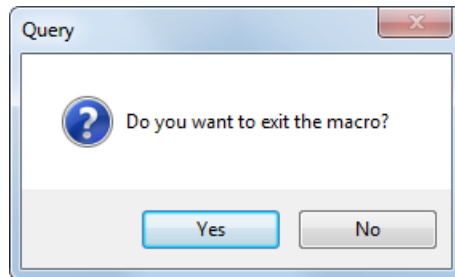
Run the macro to check if the tests work:

- 1 Create different objects in your model to test your macro. Make sure you have a primitive cylinder.
- 2 Select Home tab > Macro panel > Macro > Run. The **Run Macro** dialog is displayed.
- 3 Select your macro file or *helix\_test.mac*.
- 4 Click **Open**. The **Select a cylinder** dialog is displayed asking for you to select a cylinder.
- 5 Select a couple of objects.

- 6 Click **OK**. The following message is displayed:

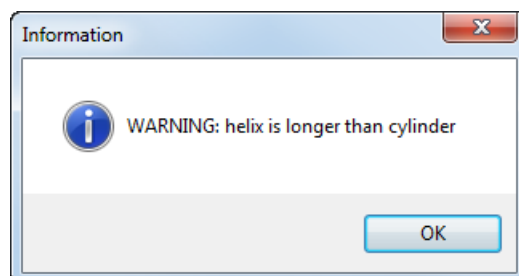


- 7 Click **OK**. The **Query** dialog is displayed:

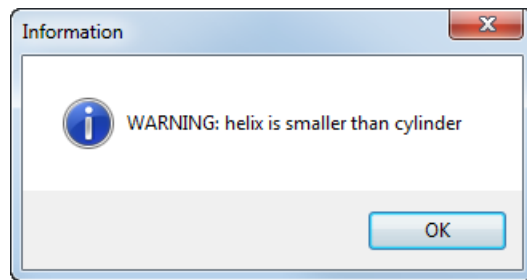


If you click **Yes**, the macro exits. If you click **No**, the **Select a cylinder** dialog appears.

- 8 Click **Yes** to exit the macro.
- 9 Run the macro again.
- 10 Select a couple of objects.
- 11 This time, when the **Query** dialog asks you whether to exit the macro, click **No**.
- 12 The **Select a cylinder** dialog appears. Select a cylinder.
- 13 Click **OK**.
- 14 The two dialogs appear as described earlier asking for the pitch and the number of turns. Enter values in each dialog and click **OK**. The helix is created around the cylinder.
- If the helix is larger than the cylinder the following message appears.



- If the helix is smaller, the following message appears.



- If the helix fits the cylinder, no message is displayed.

**15** Run the macro again and input different values for the helix to test all the options.

## Adding tests to your macro

You can either edit your macro file or open and examine the file *helix\_test.mac* in the folder:

C:\Program Files\Autodesk\PowerShapexxxx\file\examples\Macro\_Writing

where *xxxxx* is the version number of PowerShape and C is the disk on which PowerShape is installed.

The changes are given in black text.

**// This macro creates a helix**

**// Written by: John Doe**

**// Asking the user to select a cylinder**

**// and then checking that the selection**

**// contains only a cylinder**

**LET \$no\_cyl = 1**

**WHILE \$no\_cyl {**

**// Clear the selection list**

**SELECT CLEARLIST**

**// Selecting a cylinder**

**INPUT SELECTION 'Select a cylinder'**

**// Testing if a single object is selected**

**LET \$single = selection.number == 1**

```

IF $single {
  // Testing if the single object is
  // a surface

```



*The strings **Surface** and **Cylinder** must use the correct capitalisation.*

```

  LET $surf = selection.type[0] == 'Surface'
  IF $surf {
    // Testing if the surface is a cylinder
    LET $no_cyl=!(selection.object[0].type == 'Cylinder')
  }
}

IF $no_cyl {
  PRINT ERROR 'You must select a single cylinder'
  INPUT QUERY 'Do you want to exit the macro?' $prompt
  IF $prompt {
    RETURN
  }
}
}

```

```

LET cyl = selection.object[0]

// Displays dialogs to input values
// INPUT POINT 'Position of centre' $cenpos
// INPUT NUMBER 'Radius of helix' $radius
INPUT NUMBER 'Pitch (per turn)' $pitch
INPUT NUMBER 'Number of turns' $numturn

// Values to change the size of the helix
// LET $radius = 10

```

```

// LET $pitch = 4
// LET $numturn = 10

//Creating a temporary workplane
CREATE WORKPLANE
$ cyl.origin.x $ cyl.origin.y $ cyl.origin.z

// Modifying the workplane

MODIFY
NAME tmpwkhelix
XAXIS DIRECTION
X $ cyl.xaxis.x
Y $ cyl.xaxis.y
Z $ cyl.xaxis.z
ACCEPT
YAXIS DIRECTION
X $ cyl.yaxis.x
Y $ cyl.yaxis.y
Z $ cyl.yaxis.z
ACCEPT
ZAXIS DIRECTION
X $ cyl.zaxis.x
Y $ cyl.zaxis.y
Z $ cyl.zaxis.z
ACCEPT
ACCEPT

// Checking the size of the helix and warning
// the user if too small or too big
LET $helix_height = $pitch * $numturn
LET $length = abs($cyl.long[1].point[2].z)

```

```

Let $big = ($helix_height > $length)
IF $big {
PRINT ERROR 'WARNING: helix is longer than cylinder'
}
Let $small = ($helix_height < $length)
IF $small {
PRINT ERROR 'WARNING: helix is smaller than cylinder'
}

```

```

// Calculating values for the co-ordinates
LET $radius = abs($cyl.lat[1].point[1].x)
LET $neg_radius = -$radius
LET $zheight = $pitch / 4

```

```

// Creating the helix's curve
create curve
THROUGH

```

```

// The first co-ordinate
$radius 0 0
// LET start_x = $radius + $cenpos_x
// LET start_y = $cenpos_y
// LET start_z = $cenpos_z
// $start_x $start_y $start_z

```

```

// Using a loop to input the
// co-ordinates for each turn
WHILE $numturn {
LET numturn = $numturn - 1
$neg_radius $radius $zheight
$neg_radius $neg_radius $zheight
$radius $neg_radius $zheight

```

```

    $radius $radius $zheight
}

// Exiting curve creation mode
// and deleting the temporary
// workplane

Select
SELECT CLEARLIST
SELECT ADD WORKPLANE 'tmpwkhelix'
DELETE

```

### *More information on adding tests to your macro*

Two tests are added to:

- check if a single object is selected and that it is a cylinder
- check if the helix is smaller or larger than the cylinder

The tests used the **IF** command to check if the data is valid. With any test, you must decide what to do if the data is not valid.

The macro will fail if a cylinder is not selected as the first object. When selecting objects, we cannot always guarantee which is the first object. We have restricted users to selecting a single cylinder.

- The following command assigns a value of 1 to the variable *no\_cyl*. This is the condition of the loop and shows that no single cylinder is selected.

```
LET $no_cyl = 1
```

- The **While** loop continues to perform its commands while no cylinder is selected.

```
WHILE $no_cyl {
```

*Carry out commands within the brackets*

```
}
```

- In the loop, the following clear the selection list and ask the user to select a cylinder.

```
SELECT CLEARLIST
```

```
INPUT SELECTION 'Select a cylinder'
```

- Test to see if the selection only contains a single object. In the following command, **selection.number** is the number of items selected.



**LET \$single = selection.number == 1**

The following statement:

**selection.number == 1**

checks if the left and right sides are equal. In our case, we want to know if 1 object is selected. If this is true, then **\$single** becomes 1. Otherwise **\$single** becomes zero.

- The following checks the value of **\$single**. If the value is 1, then the commands within the brackets are carried out.

**IF \$single {**

*Carry out commands within the brackets*

**}**

If the value is 0, then the commands after the closing bracket are carried out.

- These are the commands in brackets:

**LET \$surf = selection.type[0] == 'Surface'**

**IF \$surf {**

**LET \$no\_cyl=!(selection.object[0].type == 'Cylinder')**

**}**

They check if the single object is a surface and whether that surface is a primitive cylinder. If the object is a primitive cylinder, then the variable **\$no\_cyl** becomes 0.

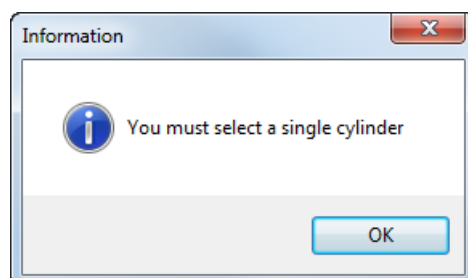
- When we have tested the selection and still do not have a single cylinder selected, we want to tell the user that a single cylinder must be selected and ask whether to exit the macro.

This command checks if **\$no\_cyl** is 1 and then displays two dialogs.

**IF \$no\_cyl {**

- The following command displays one of the dialogs.

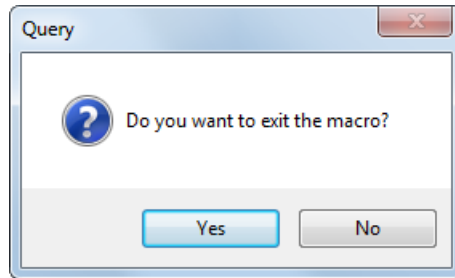
**PRINT ERROR 'You must select a single cylinder'**



This tells you what is wrong. As soon as the user clicks **OK**, the following command is carried out.

## INPUT QUERY 'Do you want to exit the macro?' \$prompt

This displays the following dialog.



If the user clicks **Yes**, the variable **\$prompt** becomes 1. If the user clicks **No**, the variable becomes 0.

If **\$prompt** is 1, then the command **RETURN** is carried out. This command exits the macro.

```
IF $prompt {  
    RETURN  
}
```

- The second test warns the user if the helix is longer or smaller than the cylinder. The commands below test the size of the helix against the length of the cylinder and display warnings where necessary.

```
LET $helix_height = $pitch * $numturn
```

```
LET $length = abs($cyl.long[1].point[2].z)
```

```
Let $big = ($helix_height > $length)
```

```
IF $big {
```

```
PRINT ERROR 'WARNING: helix is longer than cylinder'
```

```
}
```

```
LET $small = ($helix_height < $length)
```

```
IF $small {
```

```
PRINT ERROR 'WARNING: helix is smaller than cylinder'
```

```
}
```

---

# Examples of macros

## Blanking

Using these macros to blank items.

```
// Blanking all curves
QUICK QUICKSELECTWIRE
DISPLAY BLANKSELECTED
//
// Blanking all surfaces
QUICK QUICKSELECTSURF
DISPLAY BLANKSELECTED
```

## Calculate the volume of each solid in the selection

Use this macro to calculate the volume of each solid in the selection and print the total volume of all the solids.

```
// This selects all the solids in the model
//
FILTERBUTTON FilterItems
SelectType solid
All
ACCEPT
//
REAL s_total = 0
PRINT 'Start total = '$s_total
//
LET numturn = selection.number
//
WHILE $numturn {
    LET $numturn = $numturn - 1
    REAL s_vol = selection.object[$numturn].volume
    LET s_name = selection.object[$numturn].name
    PRINT 'Volume of solid '$s_name ' = '$s_vol
    REAL s_total = ($s_total + $s_vol)
}
//
SELECT EVERYTHING PARTIALBOX
SELECT clearlist
//
PRINT 'Total volume of selected solids = '$s_total
```

## Close all models

Use this macro to close all open models.

```
LET n = window.number
LET w = $n > 0
WHILE $w {
    FILE CLOSE SELECTED YES
    LET w = window.number
}
```

## Create a curve from a selection of points

Use this macro to create a curve from a selection of points.

```
// This example uses lists and vectors
// This only works correctly if there are no
// duplicate points. The curve is also created
// in the order the points are taken from
// the selection list and this is only
// really controlled by the number order they
// are created in. Need a model with points in it

// select all the points in the model
FILTERBUTTON FilterItems
SelectType Point
InvertType
InvertType
All
accept

// Quit if we have no points selected
LET numpts = selection.number
LET e = ($numpts==0)
IF $e {
    PRINT 'No points are selected.'
    return
}
```

```

// Create a list of points
LIST all_points = { }
LET i = 0
LET carry_on = ($i < $numpts)
WHILE $carry_on {
    LET point_obj = SELECTION.OBJECT[$i]
    VECTOR pt = $point_obj.POSITION
    LIST_ADD $all_points END $pt
    LET i = $i + 1
    LET carry_on = ($i < $numpts)
}

// Create a curve that goes through all the points
CREATE CURVE THROUGH
LET i = 1
LET carry_on = ($i <= $numpts)
WHILE $carry_on {
    VECTOR pt = $all_points[$i]
    REAL x = $pt[1]
    REAL y = $pt[2]
    REAL z = $pt[3]
    STRING command = concatenate('abs ' ; $x ; ' ' ; $y ; ' ' ;
    $z)
    EXECUTE COMMAND $command

    LET i = $i + 1
    LET carry_on = ($i <= $numpts)
}

SELECT
EVERYTHING PARTIALBOX

```

## Create a tapered helix

Use this macro to create a tapered helix.

```
// This macro creates a tapered helix for either an
external or internal thread.

//

// Ask the user to select a workplane and then check that
the selection contains only a workplane,
// the workplane is then made activate.
// The Helix will be created about this workplane, so Z
must be aligned at the centre of the screw
//

// Use a while loop to make the correct selection
LET $no_wkp = 1
WHILE $no_wkp {

    // Clear the selection list
    select clearlist

    // Selecting a workplane
    INPUT SELECTION 'Select a workplane'

    // Testing if a single object is selected
    LET $single = selection.number == 1
    IF $single {
        // Test if the single object is a workplane
        LET $seltype = selection.type[0] == 'Workplane'
        IF $seltype {
            // If the selection is correct activate the
            workplane and carry on creating the curves
            pri 'Selection correct'
            Modify ACTIVATE Accept
            let $no_wkp = $no_wkp - 1
        }
    } ELSE {
        // Else ask to exit the macro or make a new selection
    }
}
```

```

        INPUT QUERY 'Do you want to exit the macro?'
$prompt
    IF $prompt {
        // If YES exit the macro
        Print 'Exiting the macro'
    RETURN
    } ELSE {
        // Try selecting again
        select clearlist
        print 'Trying selecting again'
        INPUT SELECTION 'Select a workplane'
    }
}
}

```

```

// Prompt the user to input the values for the number of
turns, radius and height

```

```

// Query whether the thread is internal of external
input number 'Number of turns (whole number)' $hn
input number 'Radius of the helix' $hr
input number 'Height of the helix' $hh
input query 'Is this an external thread?' $yesno

```

```

real $hz1 = ($hh / $hn)
real $hz2 = ($hh - ($hh / $hn))

```

```

if $yesno {

```

```

    // if the thread is external create this curve
    create curve helix
    0
    height ($hh / $hn)
    turns 1
    same off
    radius2 ($hr - 1)

```

```

radius1 ($hr)
accept
string $c1 = selection.name[0]
create curve helix
0 0 $hz1
height ($hh - (2*($hh / $hn)))
turns ($hn - 2)
same on
radius1 ($hr)
accept
create curve helix
0 0 $hz2
height ($hh / $hn)
turns 1
same off
radius1 ($hr - 1)
radius2 ($hr)
accept

} else {

// if the thread is internal create this curve
create curve helix
0
height ($hh / $hn)
turns 1
same off
radius2 ($hr + 1)
radius1 ($hr)
accept
string $c1 = selection.name[0]
create curve helix
0 0 $hz1
height ($hh - (2*($hh / $hn)))
turns ($hn - 2)

```



```

    same on
    radius1 ($hr)
    accept
    create curve helix
    0 0 $hz2
    height ($hh / $hn)
    turns 1
    same off
    radius1 ($hr + 1)
    radius2 ($hr)
    accept

}

// Create a composite curve from the three separate
// curves
select clearlist
create curve compcurve
add curve $c1
save
checkquit

```

## Create geometry

Use this macro to create geometry to be used in the macro.

```

// this creates the geometry to be used in the macro
// Two intersecting planes are created and then a curve
// is created from the intersection.
PRINCIPALPLANE XY
create surface PLANE
0
PRINCIPALPLANE ZX
create surface Plane
PLANE
0
SelectAll
create curve INTERSECT
ACCEPT
//
// set the name to be used for the curve

```

```

STRING new_name = 'fred'
//
// find out how many items were created
LET c_obj = created.number
PRINT 'Number of created items ' $c_obj
//
// the WHILE loop checks that a composite curve was
// created and renames the composite curve
//
WHILE $c_obj {
//
  LET $c_obj = $c_obj - 1
//
  LET n = created.object[$c_obj].name
  LET t = created.type[$c_obj]
  IF $t == 'Composite Curve' {
    LET $t = 'Compcurve'
  }
//
  SELECT clearlist
//
  LET com = concatenate('add '; $t; ' "; $n; "')
  EXECUTE COMMAND $com
  PRINT $com
//
  RENAME
  VAR_NAME $new_name
  ACCEPT
//
}

```

## Create normal workplane for each point on a curve

The following example creates a normal workplane for each point on a curve:

```

// This macro assumes you have already created the curve
// in the model
// A dialog is raised to select the curve you want to
// use.
// Does not work for composite curves
//
// Selecting a curve
INPUT SELECTION 'Select a curve'
//
// find out the name of the curve
LET name = selection.name[0]
PRINT $name
//
// find out the number of points in the curve
LET numturn = curve[$name].number

```

```

PRINT $numturn
select clearlist
//
// create a point at each keypoint of the curve
WHILE $numturn {
    select clearlist
    create workplane NormalSingle
    Position
    KEYPOINT
    add Curve $name
    NUMBEREDPOINT
    KEYPTNUMBER $numturn
    APPLY
    cancel
//
    LET numturn = $numturn - 1
}
//
select

```

## Create text in a macro

Use this macro to create text in the macro.



*When **LIVETEXT** is on, this macro will not work; you cannot enter live text using a variable.*

```

// How to create text using a variable in a macro
// Livetext on does not work
//
//
TOOLS PREFERENCES
UNITPREFS
TEXTPREFS
TEXT LIVETEXT OFF
ACCEPT
//
STRING fred = 'wibble'
LET MYTEXT = 'fred'
// INPUT TEXT 'Enter some text' $fred
//
CREATE TEXT TEXT HORIZONTAL YES
0 0 0
ScrolledText $fred
Accept
TEXT FONT Arial
TEXT HEIGHT 0.3
TEXT PITCH 0.1
SELECT
select clearlist
//

```

```

TOOLS PREFERENCES
UNITPREFS
TEXTPREFS
TEXT LIVETEXT ON
ACCEPT
//
LET com = concatenate(''; ($fred); '')
p $fred
CREATE TEXT TEXT HORIZONTAL YES
20 0 0
EXECUTE COMMAND $com
SELECT

```

## Deactivate all solids in a model

Use this macro to deactivate all solids in a model.

```

// Need some solids in the model
// Get the name of the currently active solid (this will
return "There is no active solid" if there isn't an
active solid)
//
STRING active_solid_name = SOLID.ACTIVE
// Deactivate the active solid
LET e = SOLID[$active_solid_name].EXISTS
IF $e {
    SELECT CLEARLIST
    ADD SOLID $active_solid_name
    MODIFY MODIFY DEACTIVATE ACCEPT
    SELECT CLEARLIST
}

```

## Deleting pcurves

Use this macro to delete pcurves.

```

toolbar tools edit
toolbar tools fixing
TRIMREGIONEDIT
//
// The following command was added
//
EDITPCURVE
//
ADD_ALL_CURVES
DELETE
TOOLBAR TREDIT LOWER SELECT
SELECT CLEARLIST

```

## DO - WHILE loop macro

This macro uses a DO-WHILE loop to create a point and ask a question.

```
// Need a model open for this to work
//
DO {
    PRINT 'looping'
    create point
    0 0 0
    select
    // ask a question to get the 1 or 0 for the exit of the
    loop
    INPUT QUERY 'Do you want to create another hole?' $fred
} WHILE $fred
PRINT 'finishing'
RETURN
```

## Dynamic sectioning

Use this macro to create a dynamic section.

```
VIEW CLIPPLANES RAISE
VIEW CLIPPLANES EDGES ON
```

## Exporting multiple images

Use this macro to export images to a file.

```
// Need to have a 3D object in the model and need to
change the macro to select that object for it to be
rotated
//
// Here is the powershape macro that made the frames:
// The incremental rotation per frame.
INT inc = 60
//
// The maximum angle through which to rotate.
INT max_angle = 360
//
INT frame_number = 0
//
LET true = 1
WHILE $true {
    //
    // Make the filename for this frame.
    LET frame_number = $frame_number + 1
    //
    // Make a STRING containing the frame number.
    STRING frame_name = inttostring($frame_number)
```

```

//
// Pad this name with leading zeros to ensure the names
collate correctly.
STRING padded_name = padleading($frame_name; 5; '0')
//
// Make the complete filename.
STRING filename = concatenate('e:xxxx\PRINT\f';
$padded_name; '.png')
//
// Print to the file.
print tofile replace $filename
//
// Have we finished?
LET angle = $inc * ($frame_number - 1)
LET finish = ($angle > $max_angle)
IF $finish {
    RETURN
}
PRINT "Angle = " $angle
//
// Rotate the target object.
select add solid '1'
edit rotate
angle $inc
apply
dismiss
select
select clearlist
}
//
// This macro creates a number of .png files, one per
frame.
// It may be more convenient to create .jpg files.
// You can now turn these frames into a movie.

```

## Export using variables

Use this macro to export to a dgk file using variables.

```

// need to have a model open with some items in it to
export

```

```

// Other conversions
//=====
// inttoreal
// inttostring
// realtoint
// realtostring
// stringtoint
// stringtoreal
//=====

```

```

//
// set path to export to
//
LET path = 'e:\xxxx\'
//
// Set the value of the INT
INT numturn = 10
//
WHILE $numturn {
    // Convert the INT to a STRING
    STRING fred = inttostring($numturn)
    //
    // Do the export using concatenate
    selectall
    LET com2 = concatenate('file export '; $path; $fred;
        '.dgk')
    PRINT $com2
    EXECUTE COMMAND $com2
    //
    LET numturn = $numturn - 1
//
}

```

## Importing components from an .xt file

Use this macro to import components from an .xt file.

```

// The macro will work if you open a New model then
// Import the xt file.
// It assumes that there are no previously named levels.
// It also assumes that the objects imported are
// components.
//
// Select all the imported components
//=====
//
selectall
//
// store the number of components
//=====
//
LET numturn = selection.number
//
// Start the loop
//=====
//
WHILE $numturn {
    //
    // Set some variables
    //=====
    LET s_com = $numturn - 1

```

```

LET $l_name = selection.name[$s_com]
//
// Set the start number of 501 for the levels
//=====
LET lev_num = 500 + $numturn
//
// renames the level with the name of the component
//=====
LET com = concatenate('LEVEL RENAME '; $lev_num; ' ';
$l_name)
EXECUTE COMMAND $com
//
//clear the selection so one component can be added to
a level
//=====
Select clearlist
add Component $l_name
//
// adds the selection to the renamed level
//=====
LET com = concatenate('LEVEL POPUP RAISE '; $lev_num)
EXECUTE COMMAND $com
Level Popup AddSelection
//
// select everything again
//=====
selectall
//
// reset the loop number
//=====
LET numturn = $numturn - 1
}

```

## Move points on a curve

Use this macro to move points on a curve.

```

// This relies on the compcurve being created with
// an even number of points in a vertical line.
// The point of the tooth should be the even number.
// The move gradually gets bigger.
//
select clearlist
//
// Selecting the composite
INPUT SELECTION 'Select a composite curve'
LET c_name = selection.object[0].name
select clearlist
INPUT NUMBER 'Enter distance to move point by' $Distance
add compcurve $c_name
//

```



```

// number of points in the curve
LET c_num = compcurve[$c_name].point.number
//
// set distance m to move the point
REAL m = 0
WHILE $c_num {
    // add the curve
    add compcurve $c_name
    //
    //select point on curve
    select_points $c_num
    end_select
    //
    // move the point
    $m 0 0
    //
    // clear the selection
    select clearlist
    //
    // set the new distance value of m
    LET m = $m - $Distance
    //
    // set the new point number
    // even numbers and top of tooth is every two points
    LET c_num = $c_num - 2
}

```

## Select and add object

Use this macro to add the selected object.

```

// adds the first item in the selection
//
SELECTALL
//
LET n = selection.name[0]
LET t = selection.type[0]
//
select clearlist
//
LET com = concatenate('add ' ; $t ; ' ' ; $n ; ' ')
EXECUTE COMMAND $com
PRINT $com

```

## Offset surface curves by different distances

Use this macro to offset surface curves by different distances.

```
// Need to have a powersurface in an open model
//
LET $no_pow = 1
WHILE $no_pow {
    // Clear the selection list
    SELECT CLEARLIST
    // Selecting a powersurface
    INPUT SELECTION 'Select a single Powersurface'
    // Testing IF a single object is selected
    LET $single = selection.number == 1
    IF $single {
        // Testing IF the single object is a surface.
        // The strings Surface and Powersurface must use the
        // correct capitalisation.
        LET $surf = selection.type[0] == 'Surface'
        IF $surf {
            // Testing IF the surface is a Powersurface
            LET $no_pow =! (selection.object[0].type ==
                'Powersurface')
        }
    }
    IF $no_pow {
        PRINT ERROR 'You must select a single powersurface'
        INPUT QUERY 'Do you want to exit the macro?' $prompt
        IF $prompt {
            RETURN
        }
    }
}
//
LET s_name = selection.object[0].name
//
select clearlist
//
INPUT NUMBER 'Enter overall distance to offset furthest
surface curve by' $Distance
//
// number of laterals in the surface
LET s_num = surface[$s_name].nlats
//
select clearlist
//
WHILE $s_num {
    // add the surface
    add surface $s_name
    //
```

```

// select a curve on a surface
// have to use the concatenate and EXECUTE COMMAND to
piece together the add lateral command
LET sel_curve = concatenate('select_lats '; $s_num)
EXECUTE COMMAND $sel_curve
//
// move the point
toolbar tools edit
EDIT SUBEDITS ON
edit offset
distance $Distance
select
//
// clear the selection
select clearlist
//
// set the new Distance value to be
LET Distance = $Distance - ($Distance / $s_num)
//
// set the new surface curve number
LET s_num = $s_num - 1
}

```

## Open psmodels from a directory list

Use this macro to open psmodels from a directory list.

```

// Use directory['pathname'].files['pattern']
// to open all psmodels from a known directory

// Get list of models in a known directory
let model_list =
directory['E:\homes\clb\xxxx'].files['*.psmodel']

// Set the number of psmodels in the directory
let num_models = LENGTH($model_list)

// Create a while loop to open the psmodels
LET i = 1
LET carry_on = ($i <= $num_models)
WHILE $carry_on {

    // Find the name of the psmodel
    let model_name = $model_list[$i]

```

```

print $model_name

// Construct command to open the psmodel
string command = concatenate('name '; $model_name)
print $command

// Open the psmodel
FILE OPEN
EXECUTE COMMAND $command
ACCESS READWRITE
ACCEPT

// reset the number to loop to the next psmodel
LET i = $i + 1
LET carry_on = ($i <= $num_models)

}

```

## Open x\_t from a directory list

Use this macro to open all files of type x\_t from a known directory.

```

// Use directory['pathname'].files['pattern']
// to import all files of type x_t from a known directory
// Each file is imported into its own psmodel

// Get list of models in directory
let model_list =
directory['E:\homes\clb\xxxx'].files['*.x_t']

// Set number of files in the directory
let num_models = LENGTH($model_list)

// Create a while loop to import all the files
LET i = 1
LET carry_on = ($i <= $num_models)
WHILE $carry_on {

```

```

// open a psmodel to import the file into
// This line can be commented out if all files
// are required in the same psmodel
FILE NEW

// Find the name of the file
let model_name = $model_list[$i]
print $model_name

// Construct command to open the file
string command = concatenate('file import ';
$model_name)
print $command

//Import the file
EXECUTE COMMAND $command

// reset the number to loop to the next file
LET i = $i + 1
LET carry_on = ($i <= $num_models)

}

```

## Using LOOP to print the length of lines to a file

Use this option to print the lengths of lines to a file. The name and location of the file is specified at run-time.

```

args{
STRING filename
}
//
// in the command window enter a line like
// macro run E:\testdata\test_macros\loop-to-PRINT-
length-of-lines-to-a-file.mac 'E:xxxx\fred.txt'
// need to have a model open with some lines in it
//
// -----
// Open txt outfile to hold the report.

```

```

// -----
LET use_dialog = $filename == 'dialog'
IF $use_dialog {
    file outfile open Dialog
    Title Create a graphics report file
    FileTypes txt File (.txt)|*.txt
    Raise
} ELSE {
    // This must be an absolute filename.
    file outfile open replace $filename
}
//
// Open the file to PRINT to
LET filename = outfile.name
//
// PRINT the name of the file in the file
PRINT 'This file is ' $filename ' '
//-----
// Find the length of the lines
//-----
FILTERBUTTON FilterItems
SelectType Line
All
accept
//
LET numturn = selection.number
WHILE $numturn {
    LET s_line = $numturn - 1
    LET l_name = selection.object[$s_line].name
    LET l_len = line[$l_name].length
    PRINT 'Length of line '$l_name ' is '$l_len
    LET numturn = $numturn - 1
}

EVERYTHING PARTIALBOX
select clearlist
// -----
// Close the file you are printing to
file outfile close

```

## Using SWITCH

Use this macro to use SWITCH to define a variable which is compared against a list of possible values.

```

// you need some objects in the model and some selected
// IF you have two objects selected it will DO case 2 and
the default
STYLE LOWERFORM
LET e = selection.number
PRINT $e

```

```
//
STYLE RAISEFORM
SWITCH $e {
//
  case 2
  PRINT 'selection is 2'
  Style Name Blue
  //
  case 3
  PRINT 'selection is 3'
  //
  case 4
  PRINT 'selection is 4'
  Style Width 0.7
  create arc full
  0 0 0
  select
  //
  default
  PRINT 'default case'
  Style Pattern Dotted
  Select clearlist
  STYLE LOWERFORM
  //
}
PRINT 'you are at the end of the switch'
```

## Using WHILE loop to create point at centre of arc

Use this macro to create a point at the centre of an arc.

```
// need a model with some arcs in it
FILTERBUTTON FilterItems
SelectType arc
All
accept
//
LET numturn = selection.number
//
WHILE $numturn {
  LET $numturn = $numturn - 1
  LET $l_name = selection.name[$numturn]
  //
  LET s_cenx = selection.object[$numturn].centre.x
  LET s_ceny = selection.object[$numturn].centre.y
  LET s_cenz = selection.object[$numturn].centre.z
  //
  select clearlist
  //
  Create point
  $s_cenx $s_ceny $s_cenz
```

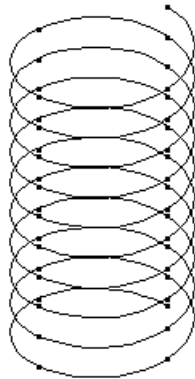
```
select
//
select clearlist
//
FILTERBUTTON FilterItems
SelectType arc
All
accept
}
//
select clearlist
EVERYTHING PARTIALBOX
```



---

# HTML application tutorial

This tutorial shows you how to write an application using Hypertext Mark-up Language (HTML) to create the following helix.



It should be possible to work through this tutorial without any prior knowledge of HTML. Detailed explanations of the HTML codes are not given; they can be found in any book on HTML.

When creating applications using HTML files, you may need to record macros to find the commands. It is therefore advisable to complete the Macro tutorial (see page 51) before working through the HTML tutorial.

## Opening a new text file

To create a new text file to store the HTML codes:

- 1 Create a new file in a text editor, such as Notepad.
- 2 Add the following to the text file:

**<HTML>**

**<HEAD>**

**</HEAD>**

**<BODY>**

**</BODY>**

**</HTML>**

- 3 Save the file as **helix.htm**.

This file now contains the basic layout of the HTML file in two sections:

**HEAD** — Contains descriptive information about the HTML file as well as other information such as style rules or scripts.

**BODY** — The basic HTML commands to define the controls.

## Adding controls to the application

To add controls in the HTML file:

- 1 Add code to the **BODY** section so that it looks as follows:

```
<BODY>
```

```
<h1>Helix creation</h1>
```

```
<FORM NAME=helix>
```

```
Radius <INPUT TYPE=text NAME=radius VALUE="10" > <p>
```

```
Pitch <INPUT TYPE=text NAME=pitch VALUE="4" > <p>
```

```
Turns <INPUT TYPE=text NAME=turns VALUE="10" > <p>
```

```
<INPUT TYPE=button VALUE=" Apply " ><p>
```

```
</FORM>
```

```
</BODY>
```

- 2 Save the file.

The **FORM** object lets you to add controls that input data. It is defined as follows:

```
<FORM NAME=helix>
```

```
</FORM>
```

The **INPUT** object lets you add controls inside the form. The code has added two types of control:

- **Text box**

```
<INPUT TYPE=text NAME=radius VALUE="10" >
```

This code contains a variable called **VALUE**. This puts a default value in the text box.

- **Button**

`<INPUT TYPE=button VALUE=" Apply " >`

## Displaying the HTML file in PowerShape

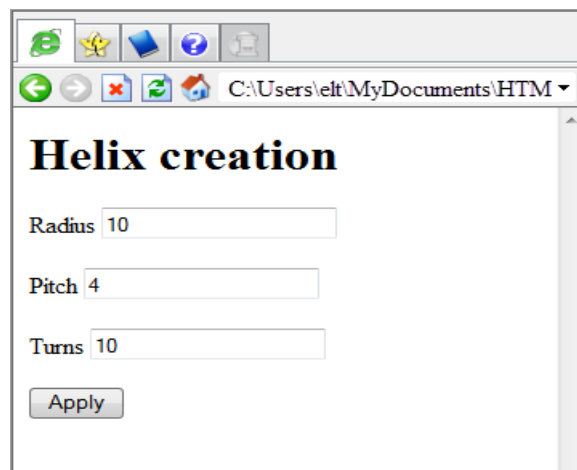
Open the file in Internet Explorer inside PowerShape to see what the html page looks like:

- 1 Start PowerShape.
- 2 Double-click the Command box in the status bar to open the Command window.
- 3 In the Command window, type:

**browser explorer {path}helix.htm**

where **{path}** is the location of *helix.htm*

You should see the following:



You can change the values in the text boxes and click the **Apply** button, but, as yet, this application does nothing in PowerShape.

## Connecting to PowerShape using VBscripts

You can use VBscripts to write the code that allows you to communicate with PowerShape. You can also use other script languages such as Javascript (see page 123).

- 1 Add code to the **HEAD** section so that it looks like this:

`<HEAD>`

`<script language="VBscript">`

`// Connect to the PowerShape`

```
set pshape = Window.external
```

```
</script>
```

```
</HEAD>
```

- 2 Save the file.

The line with the two slashes `//` is a comment. The script is enclosed in the following lines of code:

- `<script language="VBscript">`  
`</script>`

The language used by the script is given in the first line.

The following command connects PowerShape using the object called *pshape*:

- `set pshape = Window.external`

## Interacting with PowerShape

To make the dialog work with PowerShape:

- Add the commands that communicate with PowerShape to create a simple helix (see page 51).
- Add a procedure (see page 106).
- Link the procedure to the **Apply** button (see page 110).

## Adding the `Apply_click()` procedure

PowerShape understands the commands used in macros. The best way to work out the commands to use is by recording a macro.

You are strongly recommended to complete the Helix macro tutorial (see page 51) before creating your own HTML applications.

The following are commands from the macro in the Helix macro tutorial:

```
LET $radius = 10
```

```
LET $pitch = 4
```

```
LET $numturn = 10
```

```
LET $neg_radius = -$radius
```

```
LET $zheight = $pitch / 4
```

```
create curve
```

```

THROUGH
$radius 0 0
WHILE $numturn {
LET numturn = $numturn - 1
$neg_radius $radius $zheight
$neg_radius $neg_radius $zheight
$radius $neg_radius $zheight
$radius $radius $zheight
}
Select

```

The following steps show you how to convert these commands into vbscript commands:

- 1 In the **script** section, add the procedure called **Apply\_click()** as shown below.

```
<script language="VBscript">
```

```

// Connect to PowerShape
set pshape = Window.external

```

```
Sub Apply_click()
```

```

//Calculating values for the coordinates
neg_rad = - document.helix.radius.value
zheight = document.helix.pitch.value /4

```

```

//Creating the helix's curve
pshape.Exec "Create curve"
pshape.Exec "through"

```

```

//First coordinates of the curve
pshape.Exec "abs " & document.helix.radius.value & " 0 0"

```

```

//Using a loop to input the coordinates from each turn

```

```

Counter = document.helix.turns.value
Do Until Counter = 0
Counter = Counter - 1
pshape.Exec neg_rad & " " & document.helix.radius.value & " " &
zheight
pshape.Exec neg_rad & " " & neg_rad & " " & zheight
pshape.Exec document.helix.radius.value & " " & neg_rad & " " &
zheight
pshape.Exec document.helix.radius.value & " " &
document.helix.radius.value & " " & zheight
Loop

//Exiting curve creation mode
pshape.Exec "Select"

End Sub

```

```
</script>
```

- 2 Save the file.

### **More information on the *Apply\_Click()* procedure**

The following commands are in the macro:

```
LET $radius = 10
```

```
LET $pitch = 4
```

```
LET $numturn = 10
```

In the HTML file, we have already assigned values to the *radius*, *pitch* and the *number of turns* when we created their text boxes.

- We assigned values to the variables *neg\_radius* and *zheight* as in the macro commands.

The following commands are in the macro:

```
LET $neg_radius = -$radius
```

```
LET $zheight = $pitch / 4
```

In the HTML file, we use the values from the text boxes of the radius and the pitch. So for *neg\_radius*:

```
neg_rad = - document.helix.radius.value
```

This assigns the negative value of the radius to the variable *neg\_rad*.

- The command:

**document.helix.radius.value**

defines the elements in the HTML file from which the string is extracted. The code **value** extracts the numeric value of the string in the textbox called *radius*. There are two other elements, *document* and *helix*:

**document** denotes the current page;

**helix** is the name of the form which contains the text box.

- Similarly, a value is assigned to the variable *zheight*:

**zheight = document.helix.pitch.value /4**

- For the following macro commands, we use the **pshape.Exec** method to replace some of the code:

**create curve**

**THROUGH**

**\$radius 0 0**

**WHILE \$numturn {**

**LET numturn = \$numturn - 1**

**\$neg\_radius \$radius \$zheight**

**\$neg\_radius \$neg\_radius \$zheight**

**\$radius \$neg\_radius \$zheight**

**\$radius \$radius \$zheight**

**}**

**Select**

So, the **create curve** command line has become:

**pshape.Exec "create curve"**

- The **pshape.Exec** method uses strings to communicate with PowerShape.

**\$radius 0 0**

has now been replaced by:

**pshape.Exec document.helix.radius.value & " 0 0"**

The **&** joins the strings on each side of it.

So:

**document.helix.radius.value & " 0 0"**

is a single string containing the contents of the Radius text box and two zeros. This is equivalent to the macro command:

`$radius 0 0`

- The **while** loop in the macro has been replaced by **Do Until Loop**. Both loops operate in a similar way.
- The following have been replaced by the **pshape.Exec** command and variables containing strings.

`$neg_radius $radius $zheight`

`$neg_radius $neg_radius $zheight`

`$radius $neg_radius $zheight`

`$radius $radius $zheight`

The strings are combined using **&** and **" "** characters.

So, for example:

`$neg_radius $radius $zheight`

becomes:

`pshape.Exec neg_rad & " " & document.helix.radius.value & " " & zheight`

## Linking the procedure to the Apply button

To link the procedure to the **Apply** button:

- 1 Add `onClick=Apply_click()` to the input object for the **Apply** button as follows:

`<INPUT TYPE=button value=" Apply " onClick=Apply_click() >`

- 2 Save the file.



*In the string below, the **onClick** command defines the action when you click the **Apply** button. In this case, it calls the procedure **Apply\_click()**, that was added in the script:*

`<INPUT TYPE=button value=" Apply " onClick=Apply_click() >`

## Testing your application

To run your application:

- 1 Right-click in the Browser window in PowerShape to display a context menu.
- 2 Select **Refresh** from the context menu to install the latest `helix.htm` file in the browser.



- 3 Click the **Apply** button in the Browser window to create a helix using the default values.
- 4 Change the values in the three text boxes.
- 5 Click **Apply** again to create a helix using the new values.

## Adding a Quit button to exit the HTML application

You can add a **Quit** button to the form that opens a HTML file when it is selected.

The following command adds a button with label **Quit** on the HTML page:

```
<INPUT TYPE=button VALUE="Quit" onClick="document.location = 'http://www.autodesk.com'" ><p>
```

When you click the **Quit** button, the action is defined by the following:

```
onClick="document.location = 'http://www.autodesk.com'"
```

This opens the Autodesk home page, providing you have internet access from your computer. If you don't have internet access, change the address to any HTML file you can access.

To add a **Quit** button on the same line as the **Apply** button:

- 1 Remove `<p>` from the following line in the HTML file:  

```
<INPUT TYPE=button value=" Apply " onClick=Apply_click() ><p>
```
- 2 After this line, insert the following:  

```
<INPUT TYPE=button VALUE="Quit" onClick="document.location = 'http://www.autodesk.com'" ><p>
```
- 3 Save the file.

To test the **Quit** button:

- 1 Right-click in the Browser window and select **Refresh** from the context menu.
- 2 Click the **Quit** button in the Browser window to display the Autodesk home page.
- 3 To go back to the helix application, right-click in the Browser window and select **Back** from the context menu.

## Entering helix origin positions

You can change the application to allow you to enter an origin position for the helix by typing a value or clicking a position on the screen.

There are two stages to this:

- 1 Changing the interface (see page 112).
- 2 Adding the code (see page 113).

## Changing the interface

To change the interface to enable helix origin positions to be entered:

- 1 Add the following code before the code for the **Apply** button in the HTML file:

```
<hr>
```

**Input origin of the helix**

```
<INPUT TYPE=button VALUE=" Click Point " onClick=point_click()>
```

```
<INPUT TYPE=button VALUE=" Read Point " onClick=point_read()>
```

```
<p>
```

```
X <INPUT TYPE=text NAME=x_text VALUE="0"> <p>
```

```
Y <INPUT TYPE=text NAME=y_text VALUE="0"> <p>
```

```
Z <INPUT TYPE=text NAME=z_text VALUE="0"> <p>
```

```
<hr>
```

- 2 Save the HTML file.



*The INPUT command was used previously to create buttons and text boxes. Now you have added two more buttons and three additional text boxes. The `<hr>` code inserts a horizontal line on the page.*

## Adding the code

You can enter the position for the origin in one of the following ways:

- Click the **Click point** button and enter a position in PowerShape. Then click the **Read point** button to read the coordinates and display them in the **X**, **Y** and **Z** text boxes.
- Enter the coordinates directly into the **X**, **Y** and **Z** text boxes.

Adding the following script to the HTML file provides this functionality.

- 1 Before the end of the script command **</script>**, add the following procedures.

**Sub point\_click()**

**//Send command to ask for user point input**

**pshape.Exec "INPUT POINT 'Click origin' \$pos"**

**End Sub**

**Sub point\_read()**

**//Extract the position input from the variable \$pos**

**document.helix.x\_text.value = pshape.Evaluate("\$pos\_x")**

**document.helix.y\_text.value = pshape.Evaluate("\$pos\_y")**

**document.helix.z\_text.value = pshape.Evaluate("\$pos\_z")**

**End Sub**

- 2 Save the HTML file.

In the first procedure, the code allows you to click points on the screen. Remember the following command from the macro tutorial:

- **INPUT POINT 'Position of centre' \$cenpos**

This is used in the application as follows:

- **pshape.Exec "INPUT POINT 'Click origin' \$pos"**

where **pshape.Exec** sends the command from the vbscript to PowerShape.

In the second procedure, the next commands are of the form:

- **document.helix.x\_text.value = pshape.Evaluate("\$pos\_x")**

where **pshape.Evaluate** extracts values from objects in PowerShape, in this case, the x coordinate of the input position *\$pos*. The value of the coordinate is then entered into the **X** text box using the code: **document.helix.x\_text.value**

## Updating the Apply\_Click procedure

Update the **Apply\_Click** procedure to use the values from the X, Y and Z text boxes:

- 1 Find the following code in the **Apply\_Click** procedure:

```
//First coordinates of the curve
```

```
pshape.Exec "abs " & document.helix.radius.value & " 0 0"
```

- 2 Change it to:

```
//First coordinates of the curve
```

```
//pshape.Exec "abs " & document.helix.radius.value & " 0 0"
```

```
start_x=(document.helix.radius.value +  
0)+(document.helix.x_text.value + 0)
```

```
pshape.Exec "abs " & start_x & " " & document.helix.y_text.value & "  
" & document.helix.z_text.value
```

- 3 Save the HTML file.

You will notice that we added a zero to some of the variables, for example:

```
document.helix.rad_text.value
```

This variable is a string, which represents a number. By adding the zero to the variable, the string is converted into a number and used in the expression.

Instead of removing the following command, we have turned it into a comment by placing **//** in front of it:

```
//pshape.Exec "abs " & document.helix.radius.value & " 0 0"
```

This lets you to use the command again later.

## Testing your application again

You are now ready to test your application. Complete the following tests:

- Define the origin of the helix by entering values for X, Y and Z:
  - 1 Right-click in the Browser window and select **Refresh** from the context menu.
  - 2 Enter some values for **X**, **Y** and **Z** to define the origin of the helix.
  - 3 Change the **Radius**, **Pitch** and **Number of turn** values if you want.
  - 4 Click **Apply**. A helix is created with its origin at the X, Y, Z position that you entered.
  
- Define the origin of the helix using the mouse:
  - 1 Change the **Radius**, **Pitch** and **Number of turn** values if you want.
  - 2 Click the **Click Point** button.
  - 3 Click a position in the graphics window.
  - 4 Click the **Read Point** button. This enters the position coordinates into the **X**, **Y** and **Z** text boxes.
  - 5 Press **Apply**. A helix is created with its origin at the point you selected.

## Selecting objects

To extend the application so that it can create a helix around a selected cylinder, you need to add another button to the interface:

- 1 Add the following code before the **Apply** button in the HTML file:

```
Create helix around a cylinder<p>  
<INPUT TYPE=button VALUE="Select Cylinder"  
onClick=cyl_select() >
```

```
<hr>
```

- 2 Save the HTML file.

## Boolean variable called cylinder

In some commands, you need to know if a cylinder is selected. You can use a Boolean variable called *cylinder* to indicate if a cylinder is selected. When the program is run, the cylinder variable is set to *false*. When you select a cylinder and use it in the HTML application, the cylinder variable is set to *true*.

To add the Boolean variable called cylinder:

- 1 At the start of the script, find the following lines:

```
// Connect to PowerShape
```

```
set pshape = Window.external
```

- 2 After these lines, add the following:

```
//No cylinder selected
```

```
cylinder = false
```

This sets the cylinder variable to false as soon as you display the HTML file.

- 3 Save the HTML file.

## Adding code for the `cyl_select()` procedure

The user selects a cylinder and then clicks the **Select cylinder** button.

To add the **cyl\_select** procedure called by this button:

- 1 Before the end of the script command `</script>`, add the following lines.

```
Sub cyl_select()

//Check if a single cylinder is selected
If pshape.Evaluate("selection.number") = "1" Then
If pshape.Evaluate("selection.object[0].type") = "Cylinder" Then
//Cylinder selected
cylinder = True
End If
End If

If cylinder = False Then
//Tell user that 1 cylinder must be selected
//and exit the procedure
MsgBox ("1 cylinder must be selected!")
Exit Sub
End If

pshape.Exec "Let cyl = selection.object[0]"
//Extract the origin of the cylinder and put in X, Y, and Z boxes
document.helix.x_text.value = pshape.Evaluate("$cyl.origin.x")
document.helix.y_text.value = pshape.Evaluate("$cyl.origin.y")
document.helix.z_text.value = pshape.Evaluate("$cyl.origin.z")
//Extract the radius of the cylinder
document.helix.radius.value = pshape.Evaluate("$cyl.radius")

End Sub
```

- 2 Save the HTML file.

- The first part of the procedure uses the **pshape.Evaluate** command to check if a single cylinder is selected. This command extracts information from PowerShape. For example, the following extracts the number of objects selected:

**pshape.Evaluate("selection.number")**

If a single cylinder is selected, the cylinder variable is set to *true*. This indicates that a cylinder is selected.

If a single cylinder is not selected, a message box appears telling the user and the procedure is terminated. The following command terminates the procedure:

#### **Exit Sub**

- The following command assigns the name and identity of the first object in the selection to the variable *cyl* in PowerShape:

**pshape.Exec "Let cyl = selection.object[0]"**

- The next set of commands extract the coordinate values from the origin of the cylinder and put the values in the **X**, **Y** and **Z** boxes on the form:

- **document.helix.x\_text.value=pshape.Evaluate("\$cyl.origin.x")**
- **document.helix.y\_text.value=pshape.Evaluate("\$cyl.origin.y")**
- **document.helix.z\_text.value=pshape.Evaluate("\$cyl.origin.z")**

- The command below extracts the radius of the cylinder and enters the value in the **Radius** box on the form:

**document.helix.radius.value = pshape.Evaluate("\$cyl.radius")**

## **Temporary workplane**

To create the helix in the right direction along the cylinder, you can use a temporary workplane.

In the **Apply\_click** procedure, the commands can be updated to:

- Create a temporary workplane (see page 119)
- Input the first point of the helix relative to the temporary workplane (see page 121)
- Delete the temporary workplane (see page 121)



## Creating a workplane

To edit the HTML to create a workplane:

- 1 At the beginning of the **Apply\_click** procedure, add the following:

**If cylinder = True Then**

*//create a workplane and modify it*

**pshape.Exec "create workplane" & vbCrLf \_**

**& "\$cyl.origin.x \$cyl.origin.y \$cyl.origin.z" & vbCrLf \_**

**& "MODIFY" & vbCrLf \_**

**& "NAME tmpwkhelix" & vbCrLf \_**

**& "XAXIS DIRECTION" & vbCrLf \_**

**& "X \$cyl.xaxis.x" & vbCrLf \_**

**& "Y \$cyl.xaxis.y" & vbCrLf \_**

**& "Z \$cyl.xaxis.z" & vbCrLf \_**

**& "ACCEPT" & vbCrLf \_**

**& "YAXIS DIRECTION" & vbCrLf \_**

**& "X \$cyl.yaxis.x" & vbCrLf \_**

**& "Y \$cyl.yaxis.y" & vbCrLf \_**

**& "Z \$cyl.yaxis.z" & vbCrLf \_**

**& "ACCEPT" & vbCrLf \_**

**& "ZAXIS DIRECTION" & vbCrLf \_**

**& "X \$cyl.zaxis.x" & vbCrLf \_**

**& "Y \$cyl.zaxis.y" & vbCrLf \_**

**& "Z \$cyl.zaxis.z" & vbCrLf \_**

**& "ACCEPT" & vbCrLf \_**

**& "ACCEPT"**

**End If**

- 2 Save the HTML file.

You can then check if the cylinder variable is *true*. This variable is only true if a cylinder is selected and the **Select cylinder** button is clicked. If the cylinder variable is *true*, a workplane is created using the following PowerShape commands from the macro tutorial:

*//Creating a temporary workplane*

**CREATE WORKPLANE**

```
$cyl.origin.x $cyl.origin.y $cyl.origin.z
```

```
// Modifying the workplane
```

```
MODIFY
```

```
NAME tmpwkhelix
```

```
XAXIS DIRECTION
```

```
X $cyl.xaxis.x
```

```
Y $cyl.xaxis.y
```

```
Z $cyl.xaxis.z
```

```
ACCEPT
```

```
YAXIS DIRECTION
```

```
X $cyl.yaxis.x
```

```
Y $cyl.yaxis.y
```

```
Z $cyl.yaxis.z
```

```
ACCEPT
```

```
ZAXIS DIRECTION
```

```
X $cyl.zaxis.x
```

```
Y $cyl.zaxis.y
```

```
Z $cyl.zaxis.z
```

```
ACCEPT
```

```
ACCEPT
```



When executing PowerShape commands, we use the **pshape.Execute** command. If you have many **pshape.Execute** commands to send, using a single command saves time communicating with PowerShape. In this example, there is only one **pshape.Execute**. To send extra lines of commands with the single **pshape.Execute**, you can use the following syntax:

```
pshape.Exec "command line 1" & vbCrLf _  
& "command line 2" & vbCrLf _  
& "command line 3" & vbCrLf _  
& "command line 4"
```

You cannot include any comments between the lines in the above syntax.

## First point relative to workplane

Edit the HTML such that the first coordinate of the helix depends on whether a cylinder is selected:

- 1 In the **Apply\_click** procedure, find the following code for the first coordinate:

```
//First coordinates of the curve  
//pshape.Exec "abs " & document.helix.radius.value & " 0 0"  
start_x=(document.helix.radius.value +  
0)+(document.helix.x_text.value + 0)  
pshape.Exec "abs " & start_x & " " & document.helix.y_text.value & "  
" & document.helix.z_text.value
```

- 2 Change the code to the following:

```
//First coordinates of the curve  
If cylinder = True Then  
pshape.Exec "abs " & document.helix.radius.value & " 0 0"  
Else  
start_x=(document.helix.radius.value +  
0)+(document.helix.x_text.value + 0)  
pshape.Exec "abs " & start_x & " " & document.helix.y_text.value & "  
" & document.helix.z_text.value  
End If
```

- 3 Save the HTML file.



*If you have selected a cylinder, the helix must start at the coordinates in relation to the temporary workplane. Otherwise, the coordinates must be relative to the coordinates in the **X**, **Y** and **Z** boxes.*

## Deleting the workplane

Add commands to the **Apply\_Click** procedure that will delete the temporary workplane:

- 1 Find the following code in the **Apply\_Click** procedure:

```
//Exiting curve creation mode  
pshape.Exec "Select"
```

- 2 Add the following lines after the code:

```
//Delete the temporary workplane  
If cylinder = True Then
```

```
pshape.Exec "select clearlist"  
pshape.Exec "select add workplane 'tmpwkhelix'"  
pshape.Exec "delete"  
cylinder = False
```

**End If**

- 3 Save the HTML file.

When the helix is created, the temporary workplane is deleted and the cylinder variable changes to false. This indicates no cylinder is selected.



*We have used the PowerShape commands from the macro tutorial.*



## Testing the new code

You are now ready to test your application:

- 1 Save your HTML file.
- 2 Right-click in the Browser window and select **Refresh** from the context menu.
- 3 Create a cylinder surface.
- 4 In PowerShape, select the cylinder.
- 5 Click the **Select Cylinder** button on the **Helix creation** form.  
The **Radius** and the **X**, **Y** and **Z** boxes now contain values from the cylinder.
- 6 Change the **Pitch** and **Number of turn** values if you want.
- 7 Click **Apply**. A helix is created around the cylinder.

You have successfully created an application using HTML.

You could further enhance the application by adding, for example:

- tests to check the input data.
-  and  icons to indicate if a cylinder is selected or not.

## Example using Javascript

You can use other script languages instead of vbscript.

The final code of the helix example is given below in Javascript:

```
<HTML>
<HEAD>
<script language="javascript">

// Connect to PowerShape
var pshape = window.external;

//No cylinder selected
cylinder = false

function Apply_click()
{
if (cylinder == true)
{
//create a workplane and modify it
pshape.Exec ("create workplane");
pshape.Exec ("Scyl.origin.x Scyl.origin.y Scyl.origin.z");
pshape.Exec ("MODIFY");
pshape.Exec ("NAME tmpwkhelix");
pshape.Exec ("XAXIS DIRECTION");
pshape.Exec ("X Scyl.xaxis.x");
pshape.Exec ("Y Scyl.xaxis.y");
pshape.Exec ("Z Scyl.xaxis.z");
pshape.Exec ("ACCEPT");
pshape.Exec ("YAXIS DIRECTION");
pshape.Exec ("X Scyl.yaxis.x");
pshape.Exec ("Y Scyl.yaxis.y");
pshape.Exec ("Z Scyl.yaxis.z");
```

```

pshape.Exec ("ACCEPT");
pshape.Exec ("ZAXIS DIRECTION");
pshape.Exec ("X $cyl.zaxis.x");
pshape.Exec ("Y $cyl.zaxis.y");
pshape.Exec ("Z $cyl.zaxis.z");
pshape.Exec ("ACCEPT");
pshape.Exec ("ACCEPT")
} //end if

```

```

//Calculating values for the coordinates
neg_rad = - document.helix.radius.value;
zheight = document.helix.pitch.value /4;

```

```

//Creating the helix's curve
pshape.Exec ("Create curve");
pshape.Exec ("through");

```

```

//First coordinates of the curve
if (cylinder == true)
{
pshape.Exec ("abs " + document.helix.radius.value + " 0 0");
} //end if
else
{
start_x = parseFloat(document.helix.radius.value) +
parseFloat(document.helix.x_text.value);
pshape.Exec ("abs " + start_x + " " + document.helix.y_text.value + " " +
document.helix.z_text.value);
} //end else

```

```

//Using a loop to input the coordinates from each turn
Counter = document.helix.turns.value;

```

```

while (Counter > 0)
{
Counter = Counter - 1;
pshape.Exec (neg_rad + " " + document.helix.radius.value + " " +
zheight);
pshape.Exec (neg_rad + " " + neg_rad + " " + zheight);
pshape.Exec (document.helix.radius.value + " " + neg_rad + " " +
zheight);
pshape.Exec (document.helix.radius.value + " " +
document.helix.radius.value + " " + zheight)
} //end while

//Exiting curve creation mode
pshape.Exec ("Select");

//Delete the temporary workplane
if (cylinder == true) {
pshape.Exec ("select clearlist");
pshape.Exec ("select add workplane 'tmpwkhelix'");
pshape.Exec ("delete");
cylinder = false
} //end if

} //end of function apply_click

function point_click()
{
//Send command to ask for user point input
pshape.Exec ("INPUT POINT 'Click origin' $pos")
} // end of function point_click

```

```

function point_read()
{
//Extract the position input from the PowerShape
//variable $pos
document.helix.x_text.value = pshape.Evaluate("$pos_x");
document.helix.y_text.value = pshape.Evaluate("$pos_y");
document.helix.z_text.value = pshape.Evaluate("$pos_z")
} // end of function point_read


function cyl_select()
{
//Check if a single cylinder is selected
if (pshape.Evaluate("selection.number") == "1") {
if (pshape.Evaluate("selection.object[0].type") == "Cylinder")
//Cylinder selected
cylinder = true
}

if (cylinder == false)
{
//Tell user that 1 cylinder must be selected
//and exit the procedure
window.alert ("1 cylinder must be selected!");
return
} //end if


pshape.Exec ("Let cyl = selection.object[0]");
//Extract the origin of the cylinder and put in X, Y, and Z boxes
document.helix.x_text.value = pshape.Evaluate("$cyl.origin.x");
document.helix.y_text.value = pshape.Evaluate("$cyl.origin.y");
document.helix.z_text.value = pshape.Evaluate("$cyl.origin.z");
//Extract the radius of the cylinder

```



```

document.helix.radius.value = pshape.Evaluate("$cyl.radius")

} // end of function cyl_select

</script>

</HEAD>

<BODY>

<h1>Helix creation</h1>

<FORM NAME=helix >

Radius <INPUT TYPE=text NAME=radius VALUE="10" > <p>
Pitch <INPUT TYPE=text NAME=pitch VALUE="4" > <p>
Turns <INPUT TYPE=text NAME=turns VALUE="10" > <p>

<hr>
Input origin of the helix<p>
<INPUT TYPE=button VALUE=" Click Point " onClick="point_click();"
>
<INPUT TYPE=button VALUE=" Read Point " onClick="point_read();"
>

<p>
X <INPUT TYPE=text NAME=x_text VALUE="0"> <p>
Y <INPUT TYPE=text NAME=y_text VALUE="0"> <p>
Z <INPUT TYPE=text NAME=z_text VALUE="0"> <p>

<hr>

Create helix around a cylinder<p>
<INPUT TYPE=button value="Select Cylinder" onClick="cyl_select();" >

```

**<hr>**

**<INPUT TYPE=button VALUE=" Apply " onClick="Apply\_click();" >**

**<INPUT TYPE=button VALUE="Quit" onClick="document.location =  
'http://www.autodesk.com'" ><p>**

**</FORM>**

**</BODY>**

**</HTML>**

---

## Creating OLE applications

You can use the PowerShape OLE server to create applications which communicate with PowerShape.

There are two types of OLE applications:

- HTML-based

An HTML-based application consists of HTML pages and runs in the Browser window in PowerShape. It also communicates commands with PowerShape.

You can write HTML pages using various HTML or text editors. In the HTML page, you can add scripts using languages such as vbscript and javascript. The OLE commands in the scripts allow you to communicate with PowerShape.

In our examples for HTML-based applications, we use vbscript. You can download documentation on vbscript from:  
<http://www.microsoft.com>.

The *HTML application tutorial* introduces you to creating HTML-based applications using vbscripts.

- add-in

An add-in application is a program that enables you to customize and extend the functionality of PowerShape. The OLE commands in the programs allow you to communicate with PowerShape.

You can write add-in applications using programming languages, such as Microsoft Visual Basic and Microsoft Visual C++. The OLE commands in the programs enable the add-ins to communicate with PowerShape.

These applications allow you to:

- perform commonly used operations
- create easy-to-use interfaces

Both types of applications use the same OLE commands. The following sections use HTML examples.

A help file is provided for the OLE COM functions at:

<C:\Program Files\Autodesk\PowerShapexxxx\file\ole\help.chm>.

## Connecting to PowerShape using HTML

Before you can use the PowerShape OLE server, you must connect to a PowerShape session.

You can connect to an existing PowerShape session, but how you connect to PowerShape will depend on whether your application is HTML-based or an add-in.

For HTML-based applications, use:

**set pshape = window.external**

In vbscript, this would look as follows:

```
<script language="vbscript" >  
set pshape = window.external  
...  
...  
...  
</script>
```

For add-in applications, use:

**Set pshape = Getobject("PowerShape.Application")**

Both methods create the object *pshape*, which is connected to an existing PowerShape session.

With these methods, when you close the add-in applications, PowerShape remains open.

## Sending commands to PowerShape

The following method sends commands to the connected PowerShape session:

**pshape.Exec Command**

where *Command* is a string expression containing a macro (see page 7) command to run in PowerShape.

For example:

When the command button **cmdCreateLine** is clicked, a single line is produced between the coordinates entered in four text boxes *txtX1*, *txtY1*, *txtX2*, *txtY2*.

**'When the command button is clicked....**

**Sub cmdCreateLine\_Click()**

```
'Set PowerShape into single line mode
pshape.Exec "CREATE LINE SINGLE"
'Enter the origin of the line
pshape.Exec txtX1.Text & " " & txtY1.Text
'Enter the incremental move required
pshape.Exec (txtX2.Text - txtX1.Text) & _
" " & (txtY2.Text - txtY1.Text)
'Set PowerShape back to select mode
pshape.Exec "SELECT"
End Sub
```

You can split a command into two lines by using an underscore character "\_" as a separator. For example, the following commands:

```
pshape.Exec (txtX2.Text - txtX1.Text) & _
" " & (txtY2.Text - txtY1.Text)
```

are the same as the command:

```
pshape.Exec (txtX2.Text - txtX1.Text) & " " & (txtY2.Text - txtY1.Text)
```

## Getting information from PowerShape

If you can print the value of something in PowerShape, you can also extract its value using the Evaluate command. The server returns a VARIANT variable, which means the result can be a number, a string, or a vector (an array of numbers).

To use the Evaluate method, the syntax is:

```
V = pshape.Evaluate(value_string)
```

where *value\_string* is a string containing the object you require the information on.

For example, you can use the following to extract the number of selected objects:

```
V = pshape.Evaluate("selection.number")
```

For a list of strings for each object, see PowerShape object information (see page 142).

## Getting information about a model

Use the **pshape.activedocument** method to get information about an open model.

This method is assigned to an object using the following commands:

- **Dim psmodel As Object**
- **Set psmodel = pshape.activedocument**

When you set this object, it is associated with the current active model. You can use this object to check whether the model is active or editable using the following properties:

- **psmodel.active**
- **psmodel.editable**

If the model associated with *psmodel* is active, then the active property will return true, otherwise it will return false. Similarly, if the model is editable, then the editable property will return true, otherwise it will return false.



*All PowerShape commands automatically operate on the active model and some commands fail if Editable is false.*

For example:

You can restrict the commands in your add-in application to one model. The active document method allows you to observe a model, you can then check if the model is active.

```
<script language = "vbscript">
set pshape = window.external
Set psmodel = pshape.activedocument

Private Sub Apply_Click()
    If psmodel.active Then
        If psmodel.editable Then
            MsgBox ("Model editable!")
        Else
            MsgBox ("Model not editable!")
        End If
    Else
        MsgBox ("Original model not active!")
    End If
End Sub

</script>
```

## Showing and hiding the PowerShape window

To show the PowerShape window:

**pshape.Visible = True**

To hide the PowerShape window:

**pshape.Visible = False**

## Controlling the PowerShape window

You can control the PowerShape window using the **WindowState** property. It enables you to specify the following states:

- minimise
- maximise
- normalised
- bring to foreground

**pshape.WindowState = value**

You can input *value* as a number from the following table:

Value	Description
1	This is the state when you can resize and position the window.
2	Maximise window.
4	Minimise window to the taskbar.
8	Bring window to the foreground.

For example:

The following minimizes the PowerShape window, performs some commands and then maximizes the window again.

```
<script language="VBscript">
```

```
Set pshape = window.external
```

```
// This minimise the PowerShape window,
```

```
// carries out some commands, and
```

```
// maximises the window again
```

```
Sub Minimise_Click()
```

```
pshape.windowstate = 1
```

```
//Carry out some commands
```

```
...
```

```
...
```

```
...
pshape.windowstate = 2
End Sub
</script>
```

## How do I find the version number of PowerShape?

The **pshape.Version** property returns a string containing the version number of PowerShape that your application is currently connected to:

If you are not connected to PowerShape, an error is returned.

## How do I know if PowerShape is busy?

The **pshape.busy** property checks if the connected PowerShape session is busy:

If PowerShape is busy, this property returns **True**, otherwise it returns **False**.

PowerShape is registered as *busy* when:

- the **Import** or **Export** dialogs are open
- the **Print** dialog is open
- any PowerShape dialog is displayed

This property is useful when waiting for a user to input a position in an add-in application. For an example, see Add-in example using Visual Basic (see page 134).

## Add-in example using Visual Basic

This example waits for a point input in PowerShape after clicking a button called **cmdIndicate**. It then extracts its coordinates into three text boxes: *txtX*, *txtY*, and *txtZ*.

```
<script language="VBscript">
Set pshape = window.external
Private Sub cmdIndicate_Click()
'Send command to ask for user point input
'While waiting for point input, PowerShape
'will be registered as Busy
pshape.Exec "INPUT POINT 'Click Origin' $pos"
'Wait until point has been input
```



**Do**

**Loop Until pshape.Busy = False**

**'Extract the position input from the PowerShape**

**'variable \$pos which was used**

**txtX.Text = pshape.Evaluate("\$pos\_x")**

**txtY.Text = pshape.Evaluate("\$pos\_y")**

**txtZ.Text = pshape.Evaluate("\$pos\_Z")**

**End Sub**

**</script>**

If the **do...loop** is not included, the program does not wait until the point is entered. This would result in trying to extract values that are not set. Try removing this loop to see what happens.

## Show and hide dialogs, or suspend graphics during commands

To access some functions, such as changing the name of an arc, you need to display the **Arc** dialog. However, when the application uses the OLE server, you want to access the functions within it, you do not normally want to display the dialog.

The following commands control the display of the user interface and dialogs, and control graphics refreshes, as operations are carried out:

- Use **ShowForms** property to hide and display the dialogs when sending OLE commands.

**pshape.ShowForms = False**

turns off the PowerShape interface updates until the state of the property is changed.

**pshape.ShowForms = True**

restarts the display of dialogs.

- Use the following commands for one-off control of display of toolbars:

**FORMUPDATE**

updates the interface to current state. The state of **ShowForms** is unchanged.

**FORMUPDATE ON**

restarts the display of dialogs (same as *ShowForms=True*).

**FORMUPDATE OFF**

stops the display of dialogs (same as *ShowForms = False*).

- Use the following commands for one-off control of the display of the dialogs. The state of **ShowForms** is unchanged:

#### **DIALOG ON**

displays the dialog.

#### **DIALOG OFF**

hides the dialog.

- Use the following commands to suspend graphics:

#### **REFRESH OFF**

suspends graphics while operations are carried out, until **REFRESH ON** is executed

#### **REFRESH ON**

restarts the graphics

#### **REFRESH ON FORCE**

overrides stacked **REFRESH OFF** commands, to force graphics to restart

## How do I exit PowerShape using my application?

Use the **pshape.exit** command to exit the PowerShape session you are connected to.

No confirmation dialog is displayed before PowerShape quits.

## Entering positions using OLE application

You can click positions in PowerShape and then read the position data into your application.

Use the **INPUT POINT** command from the PowerShape macro language in a **pshape.Exec** command.

For example,

```
pshape.Exec "INPUT POINT 'Click origin' $pos"
```

When the position is clicked, its coordinates are assigned to the following variables: *\$pos\_x*, *\$pos\_y* and *\$pos\_z*.

You can access these variables using **pshape.Evaluate** command.

**Example using vbscript:**

```
Sub point_click()
```

```
//Send command to ask for user point input
```

```
pshape.Exec "INPUT POINT 'Click origin' $pos"
```

**End Sub**

**Sub point\_read()**

**//Extract the position input from the PowerShape**

**//variable \$pos**

**document.helix.x\_text.value = pshape.Evaluate("\$pos\_x")**

**document.helix.y\_text.value = pshape.Evaluate("\$pos\_y")**

**document.helix.z\_text.value = pshape.Evaluate("\$pos\_z")**

**End Sub**

You cannot combine these commands into one procedure. If you do, the following happens when you use the application.

- When the user clicks the position, the application continues to the next command line without receiving the *\$pos* data from PowerShape.
- If you pause the application using the **pshape.busy** property, it will loop.

## Selecting objects

This topic describes how to use selected objects in your application.

You can use the following methods to select objects for use:

- Before it is run.

As soon as the application is run, you can use the *selection* object information to interrogate the selection and then operate on the selection.
- While it is running.

You need some method of telling the application that the objects are selected. One way is to add a button to the application. When you have selected the required objects, click the button to complete the selection. You can then use the *selection* object information (see page 142) to interrogate the selection and operate on the selection.

For example:

**Private Sub Cmd\_cyl\_Click()**

**'Check if a single cylinder is selected**

**If pshape.Evaluate("selection.number") = "1" Then**

**If pshape.Evaluate("selection.object[0].type") = "Cylinder" Then**

```

'Cylinder selected
cylinder = True
End If
Else
'Tell user that 1 cylinder must be selected
'and exit the procedure
MsgBox ("1 cylinder must be selected!")
Exit Sub
End If
pshape.Exec "Let cyl = selection.object[0]"
'Extract the origin of the cylinder and put in X, Y, and Z boxes
Txt_x.Text = pshape.Evaluate("$cyl.origin.x")
Txt_y.Text = pshape.Evaluate("$cyl.origin.y")
Txt_z.Text = pshape.Evaluate("$cyl.origin.z")
End Sub

```

## Tips and tricks

Each command in an application communicates with PowerShape using the Windows interpreter. Therefore, running each command results in a short delay. If you have many PowerShape commands, this delay can last a few seconds.

To minimize the delay where you have a block of PowerShape commands, use a single execute command. Each line of commands must be separated by a special character.

You can type the **pshape.Exec** command as follows:

```

pshape.Exec "command line 1" & vbCrLf _
& "command line 2" & vbCrLf _
& "command line 3" & vbCrLf _
& "command line 4" & vbCrLf _
& "command line 5" & vbCrLf _
& "command line 6"

```

Another way to reduce the time taken is to create a macro containing the block of commands. You can then run the macro in an **Exec** command.

## Running a HTML-based application

To run an HTML-based application in the PowerShape browser window:

- 1 Start PowerShape.
- 2 Double-click the Command box in the status bar to open the Command window.
- 3 In the Command window, type:

**browser explorer {path\_of\_html\_file}**

where **{path\_of\_html\_file}** is the path to the file. This displays the HTML file in the browser window in PowerShape.

You can then use the HTML-based application in PowerShape.

## Running an add-in application

When you have created or downloaded an add-in application, you can run it inside or outside PowerShape. When you run your application, it begins executing its commands.

To run your application outside PowerShape, do one of the following:

- Use the **Run** command from the **Start** menu.
- Double click your application's icon in **Windows Explorer**.


You can also add shortcuts to your application. For further details see the Microsoft Windows Help.

To run your application inside PowerShape, you can use the Add-in Manager to create a link to your application. This enables you to run your application from within PowerShape.


For more information, see Working with add-in applications in PowerShape (see page 139).

## Working with add-in applications in PowerShape

To add an add-in application:

- 1 Select Home tab > Add-Ins panel > Add-ins > Manage. The **Add-In Manager** dialog is displayed.
- 2 Click the **Add**  button on the dialog.

A new item, called **Add-in**, is added to the list. This item is highlighted, ready for you to change its name.
- 3 In the **Title** box, type the name of the item. This name appears in the Home tab > Add-Ins panel > Add-ins menu.

- 4 In the **Command** box, type the path where the application is stored. Alternatively, click the **Browse**  button to display the **Open** dialog and search for your application .
- 5 In the **Arguments** box, type any start-up parameters for the application.
- 6 In the **Start in** box, type the path where you want your application to run.
- 7 Click **Apply** to save your changes. This adds the item to the list of available macros.
- 8 Repeat steps 2 - 8 to add more applications.
- 9 Click **Cancel** to close the dialog.



*Add-in applications are only available to the person who added them.*



To run an add-in application:

- 1 Click Home tab > Add-Ins panel > Add-ins.
- 2 Select the application from the menu.


To change the name of an Add-in:

- 1 Select Home tab > Add-Ins panel > Add-ins > Manage. The **Add-In Manager** dialog is displayed.
- 2 Select the Add-in application in the **Menu contents** list.
- 3 Edit the **Title**.
- 4 Click **Apply** to change the name.
- 5 Click **Cancel** to close the dialog.

To re-order the Add-in applications:

- 1 Select Home tab > Add-Ins panel > Add-ins > Manage. The **Add-In Manager** dialog is displayed.
- 2 Select the item you want to move.
- 3 Use the **Move Item Up**  and **Move Item Down**  buttons to reposition the selected item.
- 4 Click **Apply** to change the order.
- 5 Click **Cancel** to close the dialog.

To remove an Add-in application:

- 1 Select Home tab > Add-Ins panel > Add-ins > Manage. The **Add-In Manager** dialog is displayed.
- 2 Select the item you want to delete.
- 3 Click the **Delete**  button.
- 4 Click **Apply** to delete the item.
- 5 Click **Cancel** to close the dialog.

---

## Object information

You can access information about objects using special macro commands. These commands help you identify precisely which feature of an object you wish to retrieve and investigate.

For example, the command to access the start coordinates of a line is:

**line[*name*].start**

This retrieves the start coordinates [x, y, z] of the line called *name*.

For the x coordinate of the start position of this line, the syntax is:

**line[*name*].start.x**

In the syntax, *name* appears (in italics) as **object[*name*]**. This is the name of the object on the left of the square bracket [ ].

Sometimes, *name* appears more than once as:

**object1[*name*].object2[*name*].**

*name* of object 1 does not necessarily equal *name* of object 2.



*PowerShape allocates a unique identity number to each object. You can substitute the name of an object for its unique identity number. For example, you can use either:*

**line[id 75].start.x**, where 75 is the unique identity number of the line.

*or*

**line[1].start.x**, where 1 is the name of the line.

You can find information on the different commands for the following types of objects:

Arc (page 144)	Level (page 177)	Surface (page 206)
Application paths (page 146)	Line (page 177)	Symbol (page 220)
Assembly (page 147)	Mesh (see page 179)	Text (page 222)
Clipboard (page 155)	Mesh Doctor (page 180)	Tolerance (page 224)
Cloud (page 155)	Model (page 181)	Units (page 224)



Composite curve (page 156)	Nesting (page 184)	Updated (page 224)
Created (page 160)	Parameter (page 185)	User (page 226)
Curve (page 161)	Pcurve (page 185)	Version (page 226)
Dimension (page 165)	Point (page 187)	View (page 227)
Drawing (page 169)	Printer (page 188)	Window (page 227)
Drawing view (page 170)	Renderer (page 188)	Workplane (page 228)
Electrode (page 171)	Selection (page 189)	
File (page 175)	Sharedddb (page 196)	
Hatch (page 176)	Sketcher (page 196)	
Language (page 176)	Solid (page 196)	

## Arc commands

The following arc commands are available:

Command	Description
<b>arc[name].exists</b>	1 if arc exists; 0 otherwise.
<b>arc[name].id</b>	unique identity number of the arc in the model.
<b>arc[id n].name</b>	name of the arc that has the given identity number.
<b>arc[name].start</b>	coordinates [x, y, z] of the start position of the arc.
<b>arc[name].start.x</b>	x coordinate of the start position of the arc.
<b>arc[name].start.y</b>	y coordinate of the start position of the arc.
<b>arc[name].start.z</b>	z coordinate of the start position of the arc.
<b>arc[name].end</b>	coordinates [x, y, z] of the end position of the arc.
<b>arc[name].end.x</b>	x coordinate of the end position of the arc.
<b>arc[name].end.y</b>	y coordinate of the end position of the arc.
<b>arc[name].end.z</b>	z coordinate of the end position of the arc.
<b>arc[name].mid</b>	coordinates [x, y, z] of the mid position of the arc.
<b>arc[name].mid.x</b>	x coordinate of the mid position of the arc.
<b>arc[name].mid.y</b>	y coordinate of the mid position of the arc.
<b>arc[name].mid.z</b>	z coordinate of the mid position of the arc.
<b>arc[name].radius</b>	radius value of the arc.
<b>arc[name].centre</b>	coordinates [x, y, z] of the centre position of the arc.
<b>arc[name].centre.x</b>	x coordinate of the centre position of the arc.

<b>arc[name].centre.y</b>	y coordinate of the centre position of the arc.
<b>arc[name].centre.z</b>	z coordinate of the centre position of the arc.
<b>arc[name].length</b>	length of the circumference of the arc.
<b>arc[name].centre_mark</b>	the centre mark type. For each type of centre marker, the standard number is given below: <ul style="list-style-type: none"> <li>▪ 0 for none</li> <li>▪ 1 for dot</li> <li>▪ 2 for cross</li> </ul>
<b>arc[name].start_angle</b>	start angle of the arc.
<b>arc[name].end_angle</b>	end angle of the arc.
<b>arc[name].span_angle</b>	span angle of the arc.
<b>arc[name].style.colour</b>	colour number of line style used to draw the arc.
<b>arc[name].style.color</b>	color (USA) number of line style used to draw the arc.
<b>arc[name].style.gap</b>	gap of line style used to draw the arc.
<b>arc[name].style.weight</b>	weight of line style used to draw the arc.
<b>arc[name].style.width</b>	width of line style used to draw the arc.
<b>arc[name].level</b>	level on which the arc exists.

## Application paths command

### Command

**app.paths**

### Description

displays path information for some of the directories that PowerShape uses, for example:

Program : C:\Program  
Files\Autodesk\PowerShapexxxx\sys\ex  
xec\powershape.exe

Document : C:\Program  
Files\Autodesk\PSDocxxxx\help

Pre-config macro : C:\Program  
Files\Autodesk\PowerShapexxxx\lib\m  
acro\preconfig.mac

Post-config macro : C:\Program  
Files\Autodesk\PowerShapexxxx\lib\m  
acro\postconfig.mac

Login macro : C:\Program  
Files\Autodesk\PowerShapexxxx\lib\m  
acro\login.mac

Temp : C:\Documents and  
Settings\xxx\Local Settings\Temp

Shareddb : C:\Documents and  
Settings\All Users\Shared  
Documents\Autodesk\sharedb

Parts : C:\Documents and Settings\All  
Users\Shared  
Documents\Autodesk\parts

Local config : C:\Documents and  
Settings\xxx\Application  
Data\PowerShape\

Home : C:\Documents and  
Settings\xxx\Application Data\

## Assembly commands

### Command

**comassembly component** *"c\_name"*  
**property set** *"name" "value"*

**comassembly component** *"c\_name"*  
**property remove** *"name" "value"*

**comassembly component** *"c\_name"*  
**property remove all**

**comassembly definition** *defn\_name*  
**thumbnail\_view\_dir** *direction*

**comassembly component** *c\_name*  
**property list**

**component**  
***["c\_name"].property["name"].value***

**component**  
***["c\_name"].property["name"].exists***

**comassembly definition** *["c\_name"]*  
**property list**

**comassembly**  
***component\_defn["cd\_name"].property["name"].exists***

### Description

set/change value of property.

remove property.

remove all properties.

sets the view for the thumbnail that is displayed in the component library window. where:

*defn\_name* is the name of the component definition  
*direction* is a view direction. This may have the following values:

**top**

**bottom**

**right**

**left**

**front**

**back**

**iso1**

**iso2**

**iso3**

**iso4**

print list of properties and their values.

check value of property.

check if the property is present. Returns 1 if the component exists, 0 if it does not exist.

print list of properties of component definition and their values.

The command returns 1 if the component exists. 0 if it does not exist.

**comassembly definitions imported  
refresh**

refreshes imported definitions.  
The command is only available  
when a model is open.

**COMASSEMBLY DEFINITION "definition  
name" HIDE\_IN\_LIBRARY  
COMASSEMBLY DEFINITION "definition  
name" SHOW\_IN\_LIBRARY**

Hide/display the component  
definitions in the component  
library window.

## Relationships commands

### Command

`relationship["assembly_name"  
"relation_name"].exists`

`relationship["assembly_name"  
"relation_name"].gen_type`

`relationship["assembly_name"  
"relation_name"].add_type`

`relationship["assembly_name"  
"relation_name"].distance`

`relationship["assembly_name"  
"relation_name"].alignment`

`relationship["assembly_name"  
"relation_name"].attachment_master`

`relationship["assembly_name"  
"relation_name"].attachment_slave`

`relationship["assembly_name"  
"relation_name"].component_master`

`relationship["assembly_name"  
"relation_name"].component_slave`

`relationship["assembly_name"  
"relation_name"].is_broken`

`relationship["assembly_name"  
"relation_name"].has_distance`

`relationship["assembly_name"  
"relation_name"].tree_name`

### Description

1 if relationship exists; 0 otherwise.

returns the type of the relationship.

0 — plane/plane

1 — point to point

2 — plane/point

3 — point/plane

4 — line/line

5 — line/point

6 — point/line

7 — plane/line

8 — line/plane

returns additional type of the relationship.

distance value.

the alignment of the relationship.

master attachment name of the relationship.

slave attachment name of the relationship.

master component name of the relationship.

slave component name of the relationship

1 if relationship is broken; 0 otherwise.

1 if the relationship has a distance parameter; 0 otherwise.

tree browser name of the relationship.

## Attachment commands

Command	Description
<b>attachment[name].exists</b>	1 if exists, 0 otherwise.
<b>attachment[name].point</b>	returns point of given attachment
<b>attachment[name].vector</b>	vector of the given attachment
<b>attachment[name].is_default</b>	1 if true, 0 if false.

## External attachments on component definitions commands

**comassembly create plane\_attachment** *\$attachment\_name \$posx \$posy \$posz \$vecx \$vecy \$vecz on definition \$def\_name*

**comassembly create plane\_attachment** *\$attachment\_name \$posx \$posy \$posz \$vecx \$vecy \$vecz on instance \$inst\_name*

**comassembly create line\_attachment** *\$attachment\_name \$posx \$posy \$posz \$vecx \$vecy \$vecz on definition \$def\_name*

**comassembly create line\_attachment** *\$attachment\_name \$posx \$posy \$posz \$vecx \$vecy \$vecz on instance \$inst\_name*

**comassembly create point\_attachment** *\$attachment\_name \$posx \$posy \$posz on definition \$def\_name*

**comassembly create point\_attachment** *\$attachment\_name \$posx \$posy \$posz on instance \$inst\_name*



## Component commands

### Command

**component[*name*].min\_range\_w**

**component[*name*].max\_range\_w**

**component[*name*].min\_range**

**component[*name*].max\_range**

**component[*name*].size**

**component[*name*].exists**

**component[*name*].level**

**component[*name*].status**

### Description

minimum range of the component with respect to the world workplane.

maximum range of the component with respect to the world workplane.

minimum range of the component with respect to the active workplane.

maximum range of the component with respect to the active workplane.

size of the component.

1 if component exists; 0 otherwise.

level value of component.

status of component

0 — free state

1 — undefined

2 — fully defined

3 — over-defined

4 — error position

## Parameter commands

### Command

**parameter[name].expression**

**parameter[name].dimension**

**parameter[name].dep\_items**

**parameter[name].hidden**

**parameter[name].expfl**

**parameter[name].main**

**parameter[name].automatic**

**parameter.number**

### Description

parameter expression.

parameter dimension.

item(s) dependent on the parameter.

value of the HIDDEN flag.

value of the EXPRESSION flag.

value of the MAIN flag.

value of the AUTOMATIC flag.

number of non-hidden and non-automatic parameters in the model. This is the number of entries in the drop down list in the Parameter Editor dialog.

## Component definitions commands

Command	Description
<code>component_defn[name].exists</code>	1 if component definition exists, 0 otherwise
<code>component_defn[name].num_components</code>	number of components using the component definition
<code>component_defn[name].is_active</code>	1 if the component definition is an active assembly; 0 otherwise
<code>component_defn[name].is_sub_assembly</code>	1 if the component definition is a sub-assembly; 0 otherwise
<code>component_defn[name].num_point_attachments</code>	number of point attachments.
<code>component_defn[name].num_line_attachments</code>	number of linear attachments.
<code>component_defn[name].num_plane_attachments</code>	number of plane attachments.
<code>component_defn[name].is_imported</code>	1 if the component definition is imported; 0 otherwise.
<code>component_defn[name].is_model_defn</code>	1 if component definition is a model component definition, 0 otherwise.
<code>component_defn[name].num_solids</code>	returns number of solids.
<code>component_defn[name].num_axis_attachments</code>	number of axis attachments.
<code>component_defn[name].num_attachments</code>	number of attachments.
<code>component_defn[name].is_parametric</code>	1 if component definition is parametric; 0 otherwise.
<code>component_defn ['assembly_name'].cog</code>	returns the centre of gravity of the assembly
<code>component_defn ['component_name'].cog</code>	returns the centre of gravity of the component.
<code>preserve_params on</code>	preserves the global parameters when registering a component definition.

```
component_defn["name
"].attachment["name"].surface...
```

where ..... can be any property of a surface.

For example:

```
print
component_defn["name"].attachm
ent["name"].surface.name
print
component_defn["name"].attachm
ent["name"].surface.area
```

## Power Features commands

### Command

```
component_defn[assembly_name].pfs
ummary.source[source
path].feature[feature_name].target[tar
get_path].exists
```

```
component_defn[assembly_name].pfs
ummary.source[source
path].feature[feature_name].target[tar
get_path].flag
```

### Description

returns the stored power features summary data for required source, feature, target.

returns the value of power features summary flag for required source, feature, target.

## TU-coordinates commands

### Command

```
comassembly insert attachment
linked_by_tu ["name of defn"] ["name
of attachment"] ["surface's
name"]/surface ID POINT/PLANE t-value
u-value
```

```
component_defn[name].attachment[na
me].is_linked_by_tu
```

```
component_defn["name"].attachment["n
ame"].t
```

```
component_defn["name"].attachment["n
ame"].u
```

### Description

inserts new attachment linked to surface by tu-coordinate.

1 if attachment is linked to surface by tu-coordinates; 0 otherwise.

get t-value stored in attachment.

get u-value stored in attachment.

## Tool Solid command

### Command

**solid['*ToolSolid*'].hide**

### Description

1 if the solid is owned by another item and not displayed; 0 if the solid is hidden.

## Clipboard command

### Command

**clipboard.valid**

### Description

1 if there is something on the clipboard; 0 otherwise.

## Cloud commands

### Command

**cloud[name].level**

### Description

returns the level that the specified cloud is on.

**cloud[name].exists**

1 if the cloud exists, 0 otherwise.

**cloud[name].id**

unique identity number of the cloud in the model.

**cloud[id n].name**

name of the cloud that has the given identity number n.

**cloud[name].style.colour**

colour number of line style used to draw the cloud.

**cloud[name].style.color**

color (USA) number of line style used to draw the cloud.

**cloud[name].style.gap**

gap of line style used to draw the cloud.

**cloud[name].style.weight**

weight of line style used to draw the cloud.

**cloud[name].style.width**

width of line style used to draw the cloud.

## Composite curve commands

Commands for composite curves can take the following forms:

- **compcurve[*name*]**.....
- **composite curve[*name*]**.....

To avoid duplication, the format **compcurve[*name*]** is used throughout.

Command	Description
<b>compcurve[<i>name</i>].exists</b>	<i>1</i> is the composite curve exists; <i>0</i> otherwise.
<b>compcurve[<i>name</i>].id</b>	unique identity number of the composite curve in the model.
<b>compcurve[id <i>n</i>].name</b>	name of the composite curve that has the given identity number.
<b>compcurve[<i>name</i>].description</b>	the description of the curve is stored in the database.
<b>compcurve[<i>name</i>].closed</b>	<i>1</i> if the composite curve is closed; <i>0</i> otherwise.
<b>compcurve[<i>name</i>].item.number</b>	number of items that make up the composite curve.
<b>compcurve[<i>name</i>].length</b>	length of the composite curve.
<b>compcurve[<i>name</i>].length_between(<i>a</i>; <i>b</i>)</b>	length along the composite curve between key points <i>a</i> and <i>b</i> .
<b>compcurve[<i>name</i>].area</b>	area of the composite curve. If the composite curve is: <ul style="list-style-type: none"><li>▪ closed and planar, the area is the enclosed area.</li><li>▪ open, it is closed with a straight line for the area measurement.</li><li>▪ non-planar, PowerShape tries to construct a plane from the first few items. If this fails, the current principal plane is used. The composite curve is projected onto the plane and the area is measured from the projected curve.</li></ul>
<b>compcurve[<i>name</i>]</b>	fillets the composite curve, where <i>name</i> is the name of the composite curve.
<b>compcurve[<i>name</i>].level</b>	level on which the composite curve exists.

## Points in composite curve commands

Command	Description
<b>compcurve[<i>name</i>].point.number</b>	number of points in the composite curve.
<b>compcurve[<i>name</i>].point[<i>number</i>]</b>	coordinates [x, y, z] of the composite curve's point.
<b>compcurve[<i>name</i>].point[<i>number</i>].x</b>	x coordinate of the composite curve's point.
<b>compcurve[<i>name</i>].point[<i>number</i>].y</b>	y coordinate of the composite curve's point.
<b>compcurve[<i>name</i>].point[<i>number</i>].z</b>	z coordinate of the composite curve's point.
<b>compcurve[<i>name</i>].point[<i>number</i>].entry_tangent</b>	unit vector of the tangent direction entering the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].entry_tangent.x</b>	x value of the unit vector that defines the tangent direction entering the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].entry_tangent.y</b>	y value of the unit vector that defines the tangent direction entering the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].entry_tangent.z</b>	z value of the unit vector that defines the tangent direction entering the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].exit_tangent</b>	unit vector of the tangent direction leaving the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].exit_tangent.x</b>	x value of the unit vector that defines the tangent direction leaving the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].exit_tangent.y</b>	y value of the unit vector that defines the tangent direction leaving the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].exit_tangent.z</b>	z value of the unit vector that defines the tangent direction leaving the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].entry_tangent.azimuth</b>	azimuth angle of the tangent entering the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].entry_tangent.elevation</b>	elevation angle of the tangent entering the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].exit_tangent.azimuth</b>	azimuth angle of the tangent leaving the point.

<b>compcurve[<i>name</i>].point[<i>number</i>].exit_tangent.elevation</b>	elevation angle of the tangent leaving the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].entry_magnitude</b>	magnitude entering the point.
<b>compcurve[<i>name</i>].point[<i>number</i>].exit_magnitude</b>	magnitude leaving the point.

## Bounding box around composite curve commands

Command	Description
<b>compcurve[<i>name</i>].size</b>	size of the bounding box around the composite curve.
<b>compcurve[<i>name</i>].size.x</b>	size in the x direction of the bounding box around the composite curve.
<b>compcurve[<i>name</i>].size.y</b>	size in the y direction of the bounding box around the composite curve.
<b>compcurve[<i>name</i>].size.z</b>	size in the z direction of the bounding box around the composite curve.
<b>compcurve[<i>name</i>].min_range</b>	minimum coordinates of the bounding box around the composite curve.
<b>compcurve[<i>name</i>].min_range.x</b>	x coordinate of the minimum coordinates of the bounding box around the composite curve.
<b>compcurve[<i>name</i>].min_range.y</b>	y coordinate of the minimum coordinates of the bounding box around the composite curve.
<b>compcurve[<i>name</i>].min_range.z</b>	z coordinate of the minimum coordinates of the bounding box around the composite curve.
<b>compcurve[<i>name</i>].max_range</b>	maximum coordinates of the bounding box around the composite curve.
<b>compcurve[<i>name</i>].max_range.x</b>	x coordinate of the maximum coordinates of the bounding box around the composite curve.



<b>compcurve[<i>name</i>].max_range.y</b>	y coordinate of the maximum coordinates of the bounding box around the composite curve.
<b>compcurve[<i>name</i>].max_range.z</b>	z coordinate of the maximum coordinates of the bounding box around the composite curve.

## Centre of gravity of composite curve commands

Command	Description
<b>compcurve[<i>name</i>].cog</b>	coordinates [x, y, z] of the centre of gravity of the composite curve.
<b>compcurve[<i>name</i>].cog.x</b>	x coordinate of the centre of gravity of the composite curve.
<b>compcurve[<i>name</i>].cog.y</b>	y coordinate of the centre of gravity of the composite curve.
<b>compcurve[<i>name</i>].cog.z</b>	z coordinate of the centre of gravity of the composite curve.

## Style of composite curve commands

Command	Description
<b>compcurve[<i>name</i>].style.colour</b>	colour number of line style used to draw the composite curve.
<b>compcurve[<i>name</i>].style.color</b>	color (USA) number of line style used to draw the composite curve.
<b>compcurve[<i>name</i>].style.gap</b>	gap of line style used to draw the composite curve.
<b>compcurve[<i>name</i>].style.weight</b>	weight of line style used to draw the composite curve.
<b>compcurve[<i>name</i>].style.width</b>	width of line style used to draw the composite curve.

## Created commands

Use this group of commands to query which objects were created as a result of the last operation. These objects are accessed from the creation list.

Command	Description
<b>created.exists</b>	1 if at least one item is in the creation list; 0 otherwise.
<b>created.number</b>	number of items in the creation list.
<b>created.clearlist</b>	clears the creation list.
<b>created.object[<i>number</i>]</b>	object type and its name in the creation list. For example, <i>Line[4]</i> , <i>Arc[1]</i> . If <i>n</i> items are created, then <i>number</i> is the item's number in the creation list.
<b>created.object[<i>number</i>].syntax</b>	object information as specified by the <i>syntax</i> for object <b>created.object[<i>number</i>]</b> . The <i>syntax</i> you can use is given under each type of object. For example, if <b>created.object[1]</b> is <i>Line[2]</i> , then you can specify the <i>syntax</i> as any syntax after <b>Line[name]</b> . For further details see Line (see page 177) . For the x coordinate of the start of the line, you can use <b>created.object[1].start.x</b> where <b>start.x</b> is the syntax.

**created.type[*number*]**

type of an object in the creation list.  
For example, *Line*, *Arc*.

If *n* objects are created, then *number* is the item's number in the creation list. *number* is from 0 to (*n*-1).

When you compare the type of an object with a text string, you must use the correct capitalisation. For example, to check that `created.type[0]` is a composite curve, you must use:

**`created.type[0] == 'Composite Curve'`**

and not:

**`created.type[0] == 'Composite curve'`**

**`created.type[0] == 'composite curve'`**

**created.name[*number*]**

name of an item in the creation list.

If *n* items are created, then *number* is the item's number in the creation list.

In all cases, *number* is from 0 to (*n*-1).

## Curve commands

### Command

**curve[*name*].exists**

**curve[*name*].id**

**curve[id *n*].name**

**curve[*name*].description**

**curve[*name*].type**

**curve[*name*].number**

**curve[*name*].closed**

### Description

1 if curve exists; 0 otherwise.

unique identity number of the curve in the model.

name of the curve that has the given identity number.

the description of the curve is stored in the database.

checks the curve and returns one of the following strings:

- *Bézier*
- *Bspline*

number of points in the curve.

1 if the curve is closed; 0 otherwise.

<b>curve[<i>name</i>].start</b>	start coordinates [x, y, z] of the curve.
<b>curve[<i>name</i>].start.x</b>	x coordinate of the start of the curve.
<b>curve[<i>name</i>].start.y</b>	y coordinate of the start of the curve.
<b>curve[<i>name</i>].start.z</b>	z coordinate of the start of the curve.
<b>curve[<i>name</i>].end</b>	end coordinates [x, y, z] of the curve.
<b>curve[<i>name</i>].end.x</b>	x coordinate of the end of the curve.
<b>curve[<i>name</i>].end.y</b>	y coordinate of the end of the curve.
<b>curve[<i>name</i>].end.z</b>	z coordinate of the end of the curve.
<b>curve[<i>name</i>].length</b>	length of the curve.
<b>curve[<i>name</i>].length_between(<i>a</i>; <i>b</i>)</b>	length along the curve between key points <i>a</i> and <i>b</i> .
<b>curve[<i>name</i>].area</b>	area of the curve. If the curve is: <ul style="list-style-type: none"> <li>■ closed and planar, the area is the enclosed area.</li> <li>■ open, it is closed with a straight line for the area measurement.</li> <li>■ non-planar, the curve is projected onto the current principal plane and the area is measured from the projected curve.</li> </ul>
<b>curve[<i>name</i>].size</b>	size of the bounding box around the curve.
<b>curve[<i>name</i>].size.x</b>	size in the x direction of the bounding box around the curve.
<b>curve[<i>name</i>].size.y</b>	size in the y direction of the bounding box around the curve.
<b>curve[<i>name</i>].size.z</b>	size in the z direction of the bounding box around the curve.
<b>curve[<i>name</i>].min_range</b>	minimum coordinates of the bounding box around the curve.
<b>curve[<i>name</i>].min_range.x</b>	x coordinate of the minimum coordinates of the bounding box around the curve.

<b>curve[<i>name</i>].min_range.y</b>	y coordinate of the minimum coordinates of the bounding box around the curve.
<b>curve[<i>name</i>].min_range.z</b>	z coordinate of the minimum coordinates of the bounding box around the curve.
<b>curve[<i>name</i>].max_range</b>	maximum coordinates of the bounding box around the curve.
<b>curve[<i>name</i>].max_range.x</b>	x coordinate of the maximum coordinates of the bounding box around the curve.
<b>curve[<i>name</i>].max_range.y</b>	y coordinate of the maximum coordinates of the bounding box around the curve.
<b>curve[<i>name</i>].max_range.z</b>	z coordinate of the maximum coordinates of the bounding box around the curve.
<b>curve[<i>name</i>].cog</b>	coordinates [x, y, z] of the centre of gravity of the curve.
<b>curve[<i>name</i>].cog.x</b>	x coordinate of the centre of gravity of the curve.
<b>curve[<i>name</i>].cog.y</b>	y coordinate of the centre of gravity of the curve.
<b>curve[<i>name</i>].cog.z</b>	z coordinate of the centre of gravity of the curve.
<b>curve[<i>name</i>].style.colour</b>	colour number of line style used to draw the curve.
<b>curve[<i>name</i>].style.color</b>	color (USA) number of line style used to draw the curve.
<b>curve[<i>name</i>].style.gap</b>	gap of line style used to draw the curve.
<b>curve[<i>name</i>].style.weight</b>	weight of line style used to draw the curve.
<b>curve[<i>name</i>].style.width</b>	width of line style used to draw the curve.
<b>curve[<i>name</i>].level</b>	level on which the curve exists.

## Points in a curve commands

### Command

### Description

<b>curve[name].point[number]</b>	coordinates [x, y, z] of the point.
<b>curve[name].point[number].x</b>	x coordinate of the point.
<b>curve[name].point[number].y</b>	y coordinate of the point.
<b>curve[name].point[number].z</b>	z coordinate of the point.
<b>curve[name].point[number].selected</b>	1 if the point is selected; 0 otherwise.
<b>curve[name].point[number].dependent</b>	1 if the point is dependent; 0 otherwise.
<b>curve[name].point[number].entry_tangent</b>	unit vector of the tangent direction entering the point.
<b>curve[name].point[number].entry_tangent.x</b>	x value of the unit vector which defines the tangent direction entering the point.
<b>curve[name].point[number].entry_tangent.y</b>	y value of the unit vector which defines the tangent direction entering the point.
<b>curve[name].point[number].entry_tangent.z</b>	z value of the unit vector which defines the tangent direction entering the point.
<b>curve[name].point[number].exit_tangent</b>	unit vector of the tangent direction leaving the point.
<b>curve[name].point[number].exit_tangent.x</b>	x value of the unit vector which defines the tangent direction leaving the point.
<b>curve[name].point[number].exit_tangent.y</b>	y value of the unit vector which defines the tangent direction leaving the point.
<b>curve[name].point[number].exit_tangent.z</b>	z value of the unit vector which defines the tangent direction leaving the point.
<b>curve.selected.points</b>	Returns the number of currently selected points on a wireframe curve (an INT).
<b>compcurve.selected.points</b>	Returns the number of currently selected points on a wireframe composite curve (an INT).

<b>curve[<i>name</i>].point[<i>number</i>].entry_tangent.azimuth</b>	azimuth angle of the tangent entering the point.
<b>curve[<i>name</i>].point[<i>number</i>].entry_tangent.elevation</b>	elevation angle of the tangent entering the point.
<b>curve[<i>name</i>].point[<i>number</i>].exit_tangent.azimuth</b>	azimuth angle of the tangent leaving the point.
<b>curve[<i>name</i>].point[<i>number</i>].exit_tangent.elevation</b>	elevation angle of the tangent leaving the point.
<b>curve[<i>name</i>].point[<i>number</i>].entry_magnitude</b>	magnitude entering the curve's point.
<b>curve[<i>name</i>].point[<i>number</i>].exit_magnitude</b>	magnitude leaving the curve's point.

## Dimension commands

The following groups of dimension commands are available:

Command	Description
<b>dimension[<i>name</i>].exists</b>	1 if dimension exists; 0 otherwise.
<b>dimension[<i>name</i>].id</b>	unique identity number of the dimension in the model.
<b>dimension[id <i>n</i>].name</b>	name of the dimension that has the given identity number.
<b>dimension[<i>name</i>].value</b>	value of dimension.
<b>dimension[<i>name</i>].diameter</b>	1 if the dimension measures a diameter; 0 otherwise.
<b>dimension[<i>name</i>].leader.style</b>	style name of the leader of the dimension
<b>dimension[<i>name</i>].leader.trim</b>	1 if the option <b>Trim leader to text</b> is on; 0 otherwise. The <b>Trim leader to text</b> option trims the leader to the position of the dimension annotation.

<b>dimension[<i>name</i>].leader.keep</b>	1 if the option <b>Internal leader on small dimensions</b> is on; 0 otherwise. When you have a dimension with leaders placed on either side of the dimension, the <b>Internal leader on small dimensions</b> option adds a line so that no gap exists between the arrows of the leader.
<b>dimension[<i>name</i>].leader.marksize</b>	size of the mark on the leader of the dimension.
<b>dimension[<i>name</i>].leader.marktype</b>	standard number indicating the type of marker. For each type of marker, the standard number is given below. <ul style="list-style-type: none"> <li>▪ Dot — 1</li> <li>▪ Slash — 10</li> <li>▪ Cross — 5</li> <li>▪ Filled circle — 11</li> <li>▪ Circle — 4</li> <li>▪ Filled arrow — 9</li> <li>▪ Arrow — 8</li> </ul>
<b>dimension[<i>name</i>].annotation.style</b>	style name of the annotation of the dimension.
<b>dimension[<i>name</i>].annotation.height</b>	height of the annotation.
<b>dimension[<i>name</i>].annotation.embed</b>	1 if the annotation is embedded; 0 otherwise.
<b>dimension[<i>name</i>].annotation.horizontal</b>	1 if the annotation is set to horizontal; 0 otherwise.
<b>dimension[<i>name</i>].annotation.proportional</b>	1 if the annotation is set to proportional; 0 otherwise.
<b>dimension[<i>name</i>].annotation.italic</b>	1 if the annotation is set to italic; 0 otherwise.
<b>dimension[<i>name</i>].annotation.gap</b>	gap between the text and the leader.
<b>dimension[<i>name</i>].annotation.fraction</b>	1 if decimal part of the dimension is set to a fraction; 0 otherwise.
<b>dimension[<i>name</i>].annotation.denom</b>	denominator of the fraction.



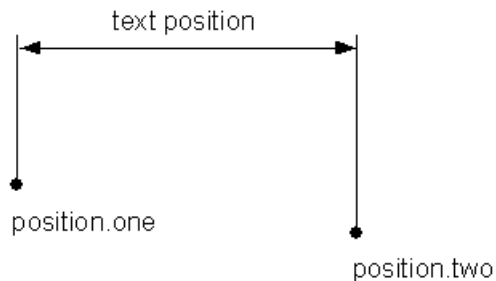
<b>dimension[<i>name</i>].annotation.angleformat</b>	number to indicate the type of angle format. For each type of angle format, the number is given below: <ul style="list-style-type: none"> <li>▪ 1 — Decimal</li> <li>▪ 2 — Degrees</li> <li>▪ 3 — Degrees - Minutes</li> <li>▪ 4 — Degrees - Minutes - Seconds</li> </ul>
<b>dimension[<i>name</i>].annotation.decimal</b>	number of decimal places of the dimension.
<b>dimension[<i>name</i>].witness.style</b>	style name of the witness line of the dimension.
<b>dimension[<i>name</i>].tolerance.style</b>	style name of the tolerance of the dimension.
<b>dimension[<i>name</i>].tolerance.value1</b>	value 1 of the tolerance range.
<b>dimension[<i>name</i>].tolerance.value2</b>	value 2 of the tolerance range.
<b>dimension[<i>name</i>].tolerance.height</b>	height of the tolerance text.
<b>dimension[<i>name</i>].tolerance.alignment</b>	number to indicate the type of tolerance alignment. For each type of tolerance alignment, the number is given below: <ul style="list-style-type: none"> <li>▪ 1 — alignment <math>75.00^{+0.15}_{-0.05}</math></li> <li>▪ 2 — alignment <math>75.00 \pm 0.10</math></li> <li>▪ 3 — alignment <math>75.15</math> <math>74.95</math></li> </ul>
<b>dimension[<i>name</i>].tolerance.decimal</b>	number of decimal places of the tolerance.
<b>dimension[<i>name</i>].style.colour</b>	colour number of line style used to draw the dimension.
<b>dimension[<i>name</i>].style.color</b>	color (USA) number of line style used to draw the dimension.
<b>dimension[<i>name</i>].style.gap</b>	gap of line style used to draw the dimension.
<b>dimension[<i>name</i>].style.weight</b>	weight of line style used to draw the dimension.
<b>dimension[<i>name</i>].style.width</b>	width of line style used to draw the dimension.
<b>dimension[<i>name</i>].level</b>	level on which the dimension exists.

There are also commands to retrieve information on the position of the dimension (see page 168).

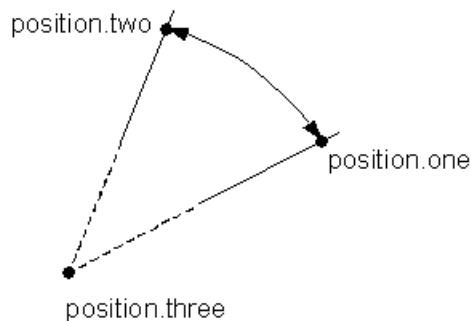
## Position of the dimension commands

A dimension is specified by its text position and various other positions, depending on the dimension type. The text position (*position.text*) is at the centre of the text. There are three other possible positions: *position.one*, *position.two* and *position.three*.

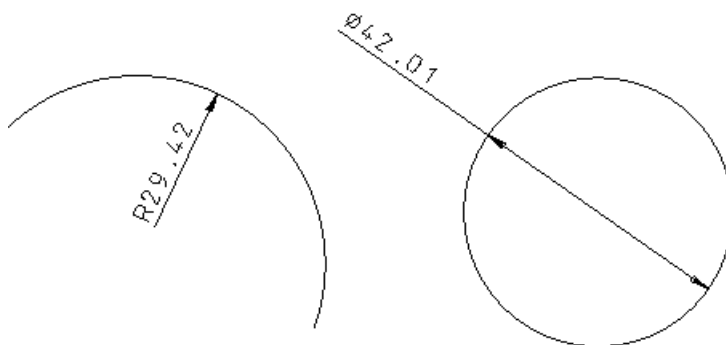
A linear dimension is specified as shown below. It has a text position (*position.text*), *position.one* and *position.two*



An angular dimension has a text position (*position.text*), *position.one*, *position.two* and *position.three*.



A radial dimension has a text position (*position.text*), *position.one*, *position.two* and *position.three*.



### Command

**dimension**[*name*].**position.text**

**dimension**[*name*].**position.one**

### Description

coordinates [x, y, z] of the position of the text of the dimension.

coordinates [x, y, z] of position.one of the dimension.

**dimension[*name*].position.two**

coordinates [x, y, z] of position.two of the dimension.

**dimension[*name*].position.three**

coordinates [x, y, z] of position.three of the dimension.

## Drawing commands

The following drawing commands are available:

### Command

### Description

**drawing[*name*].exists**

1 if drawing exists; 0 otherwise.

**drawing[*name*].description**

description of the drawing.

**drawing.number**

the number of drawings.

**drawing[*name*].id**

unique identity number of the drawing.

**drawing[id *n*].name**

name of the drawing that has the given identity number.

**drawing.name[*index*]**

returns a drawing name where *index* is greater than 0 and less than or equal to the number of drawings.

**drawing[*name*].width**

width of the drawing.

**drawing[*name*].height**

height of the drawing.

**drawing[*name*].template\_model**

name of the model containing the template\_drawing used by the drawing.

**drawing[*name*].template\_drawing**

name of the template drawing used by the drawing.

**drawing[*name*].tmpl\_model\_invalid**

1 if the model, containing the template drawing used by the drawing, exists in the database; 0 otherwise.

**drawing[*name*].tmpl\_drawing\_invalid**

1 if the template drawing, used by the drawing, exists; 0 otherwise.

**drawing[*name*].views**

number of views on the drawing.

**drawing[*name*].view.name[*N*]**

name of the *N*th view on the drawing, where  
 $0 < N \leq \text{number of views}$ .

**drawing[*name*].no\_of\_items**

number of objects on the drawing.

**drawing[*name*].view[view\_name].needs updating**

1 if the view needs updating; 0 otherwise.

## Drawing view commands

Drawing view commands are only available in conjunction with Drawing commands as indicated:

Command	Description
<b>drawing[<i>name</i>].view[<i>name</i>].xmin_extent</b>	x coordinate of the minimum extent of the view on the drawing.
<b>drawing[<i>name</i>].view[<i>name</i>].xmax_extent</b>	x coordinate of the maximum extent of the view on the drawing.
<b>drawing[<i>name</i>].view[<i>name</i>].ymin_extent</b>	y coordinate of the minimum extent of the view on the drawing.
<b>drawing[<i>name</i>].view[<i>name</i>].ymax_extent</b>	y coordinate of the maximum extent of the view on the drawing.
<b>drawing[<i>name</i>].view[<i>name</i>].scale</b>	scale of the view.
<b>drawing[<i>name</i>].view[<i>name</i>].origin</b>	coordinates [x, y, z] of the origin of the view.
<b>drawing[<i>name</i>].view[<i>name</i>].no_of_items</b>	number of objects in the view.
<b>drawing[<i>name</i>].view[<i>name</i>].transform[<i>number</i>]</b>	<p>the elements of the rotation matrix and the translation vector of the view in relation to the model space.</p> <p>The value of number determines the elements:</p> <ul style="list-style-type: none"><li>▪ 0, 1, 2 specifies the elements of the first row of the rotation matrix.</li><li>▪ 4, 5, 6 specifies the elements of the second row of the rotation matrix.</li><li>▪ 7, 8, 9 specifies the elements of the third row of the rotation matrix.</li><li>▪ 12, 13, 14 specifies elements of the translation vector.</li></ul>
<b>drawing[drawing_name].view[view_name].drawing_to_view[x ; y ; z]</b>	Use these variables to convert between drawing, view and world space.
<b>drawing[drawing_name].view[view_name].drawing_to_world[x ; y ; z]</b>	
<b>drawing[drawing_name].view[view_name].view_to_drawing[x ; y ; z]</b>	
<b>drawing[drawing_name].view[view_name].world_to_drawing[x ; y ; z]</b>	

**drawing[*drawing\_name*].view[*view\_name*].drawing\_to\_view[x ; y ; z].x**

Use X/Y/Z modifiers with the above variables to return the x-ordinate of the converted point.

## Electrode commands

The following electrode commands are available:

Command	Description
<b>electrode.list</b>	list of all electrode names.
<b>electrode.list.all</b>	
<b>electrode.list originals</b>	list of electrode names, excluding copies.
<b>electrode.list.copies</b>	list of electrode names of electrode copies.
<b>electrode[<i>name</i>].datum</b>	coordinates [x, y, z] of the origin of the electrode's datum.
<b>electrode[<i>name</i>].datum.x</b>	x coordinate of the origin of the electrode's datum.
<b>electrode[<i>name</i>].datum.y</b>	y coordinate of the origin of the electrode's datum.
<b>electrode[<i>name</i>].datum.z</b>	z coordinate of the origin of the electrode's datum.
<b>electrode[<i>name</i>].blank.name</b>	name of the electrode's blank.
<b>electrode[<i>name</i>].blank.rectangular</b>	1 if the blank is rectangular; 0 if it is circular.
<b>electrode[<i>name</i>].blank.length</b>	length of the electrode's blank.
<b>electrode[<i>name</i>].blank.width</b>	width of the electrode's blank.
<b>electrode[<i>name</i>].blank.diameter</b>	diameter of the electrode's blank.
<b>electrode[<i>name</i>].blank.height</b>	height of the electrode's blank.
<b>electrode[<i>name</i>].blank.material</b>	material of the electrode's blank.
<b>electrode[<i>name</i>].holder.catalogue</b>	name of holder catalogue.
<b>electrode[<i>name</i>].holder.base</b>	name of base holder.
<b>electrode[<i>name</i>].holder.edm</b>	name of additional EDM holder.
<b>electrode[<i>name</i>].holder.machining</b>	name of additional Machining holder.
<b>electrode[<i>name</i>].holder.&lt;base machining edm&gt;.items</b>	number of items that make up the base, machining or edm holder.
<b>electrode[<i>name</i>].holder.&lt;base machining edm&gt;.item.number</b>	

<b>electrode[name].holder.&lt;base machining edm&gt;.item(n)</b>	name of <i>n</i> th item that makes up base, machining or edm holder.
<b>electrode[name].holder.&lt;base machining edm&gt;.item(n).name</b>	
<b>electrode[name].holder.&lt;base machining edm&gt;.item(n).id</b>	ID of <i>n</i> th item that makes up base, machining or edm holder.
<b>electrode[name].holder.&lt;base machining edm&gt;.item(n).type</b>	type of <i>n</i> th item that makes up base, machining or edm holder (Solid or Symbol).
<b>electrode[name].burn_region.surfaces</b>	Returns the number of surfaces in an electrode's burn region.
<b>electrode[name].burn_region.attached</b>	Checks if a new burn region has been attached to an electrode. Returns 1 for electrodes that are part of a multi-impression burn.
<b>electrode[name].burn_region.surface[n]</b>	Zero-indexed access to the surfaces in an electrodes burn region. Normal surface attributes can be accessed, for example: <b>electrode[name].burn_region.surface[0].id.</b>
<b>electrode[name].quantity.rough</b>	the number of roughers in the electrode family.
<b>electrode[name].quantity.semi</b>	the number of semi-finishers in the electrode family.
<b>electrode[name].quantity.finish</b>	the number of finishers in the electrode family.
<b>electrode[name].undersize.rough</b>	the undersize of the rougher (in the current units).
<b>electrode[name].undersize.semi</b>	the undersize of the semi-finisher (in the current units).
<b>electrode[name].undersize.finish</b>	the undersize of the finisher (in the current units).
<b>electrode[name].frame.exists</b>	returns 1 if the electrode has a frame; 0 otherwise
<b>electrode[name].frame.length</b>	returns the length of electrode frame.
<b>electrode[name].frame.width</b>	returns the width of electrode frame.
<b>electrode[name].frame.height</b>	returns the height of electrode frame.

<b>electrode[name].frame.has_chamfer</b>	returns 1 if the electrode frame has a chamfer; 0 otherwise.
<b>electrode[name].frame.chamfer_size</b>	returns the size of chamfer on the electrode frame.

There are also General (see page 173) Electrode commands.



*In some electrode commands, you can specify the name of the electrode. For example: **electrode[name].exists**.*

*In these commands, you can also enter index n, where n is the nth electrode created in the model.*

*For example, the following expression checks if the first electrode exists: **electrode[index 1].exists**.*

## General Electrode commands

Command	Description
<b>electrode.number</b>	number of electrodes in the model.
<b>electrode[name].exists</b>	1 if the electrode exists; 0 otherwise.
<b>electrode[name].id</b>	identity number of the electrode in the model.
<b>electrode[id n].name</b>	name of the electrode that has the given identity number.
<b>electrode[name].level</b>	level on which the electrode exists.
<b>electrode[name].rotation</b>	the rotation of the electrode from the workplane of the electrode.
<b>electrode[name].sparkgap</b>	spark gap of the electrode.
<b>electrode[name].burn_depth</b>	distance in z from the bottom of the electrode to the top of the burn region.
<b>electrode[name].surface_finish</b>	the surface finish selected on the electrode family page of the wizard for that electrode.
<b>electrode[projected_area]</b>	area of the burn region as projected onto the XY plane.

<b>electrode[<i>name</i>].solid.solid_attributes</b>	attributes of the solid depending on the value of <i>solid_attributes</i> . For example: <b>electrode[<i>name</i>].solid.volume</b> volume of the solid. For a complete list of attributes, see Solid commands (see page 196).
<b>electrode[<i>name</i>].base_height</b>	height of the base of the electrode can be defined using the variable.
<b>electrode[<i>name</i>].active_solid</b>	the solid that the electrode was extracted from.
<b>electrode[<i>name</i>].active_workplane</b>	the workplane that was active when the electrode was created. (These are only available for electrodes that are extracted, not those that are copied).
<b>electrode[<i>name</i>].fillins</b>	number of fill-in surfaces associated with this electrode.
<b>electrode[<i>name</i>].fillin.number</b>	
<b>electrode[<i>name</i>].fillin(<i>n</i>)</b>	name of <i>n</i> th fillin surface for this electrode ( <i>n</i> starts at 1).
<b>electrode[<i>name</i>].fillin(<i>n</i>).name</b>	
<b>electrode[<i>name</i>].fillin(<i>n</i>).id</b>	ID of <i>n</i> th fillin surface for this electrode.
<b>electrode[<i>name</i>].details(1)</b>	the first additional description field for the electrode. By default this is the "Job No." entry.
<b>electrode[<i>name</i>].details(2)</b>	the second additional description field for the electrode. By default this is the "Works Order" entry.
<b>electrode[<i>name</i>].details(3)</b>	the third additional description field for the electrode. By default this is the "Description" entry.
<b>electrode.number.all</b>	number of all electrodes.
<b>electrode.number originals</b>	number of electrodes, excluding copies.
<b>electrode.number.copies</b>	number of electrode copies.
<b>electrode[<i>name</i>].is_copy</b>	1 if an electrode is a copy. 0 if not a copy.
<b>electrode[<i>name</i>].parent</b>	the name of parent if the electrode is a copy.
<b>electrode[<i>name</i>].copies</b>	the number of copies of this electrode.



<b>electrode[<i>name</i>].angle.a</b>	angle of rotation of the extraction vector in XY.
<b>electrode[<i>name</i>].angle.b</b>	angle from the vertical.
<b>electrode[<i>name</i>].angle.c</b>	rotation around the vector defined by <b>a</b> and <b>b</b> .
<b>electrode[<i>name</i>].burn_vector</b>	vector representing the extraction direction.
<b>electrode[<i>name</i>].vector_clearance</b>	distance the electrode is cleared from the part along the burn vector before it is moved in Z.

## File commands

Command	Description
<b>file move file</b> " <i>pathname_from</i> " " <i>pathname_to</i> "	move a file to another location.
<b>file copy file</b> " <i>pathname_from</i> " " <i>pathname_to</i> "	copy a file to another location.
<b>file move dir</b> " <i>pathname_from</i> " [ <i>pathname_to</i> ]	move a directory to another location.
<b>file copy dir</b> " <i>pathname_from</i> " " <i>pathname_to</i> "	copy a directory to another location.
<b>file create dir</b> " <i>pathname</i> "	create a new directory.
<b>file[<i>name</i>].exists</b>	1 if file exists; 0 otherwise.
<b>file[<i>name</i>].readable</b>	1 if file is readable; 0 otherwise.
<b>file[<i>name</i>].writeable</b>	1 if file is writeable; 0 otherwise.
<b>file[<i>name</i>].size</b>	returns file size in bytes.
<b>file[<i>name</i>].mode</b>	0 if file does not exists 1 if file 2 if directory.
<b>directory[<i>name</i>].exists</b>	1 if directory exists; 0 otherwise.
<b>directory[<i>name</i>].readable</b>	1 if directory is readable; 0 otherwise.
<b>directory[<i>name</i>].writeable</b>	1 if directory is writeable; 0 otherwise.
<b>directory[<i>name</i>].mode</b>	0 is directory does not exists 1 if file 2 if directory.
<b>directory['pathname'].files['pattern']</b>	returns a list of files in a directory.

## Hatch commands

The following hatch commands are available:

Command	Description
<b><code>hatch[name].exists</code></b>	1 if drawing exists; 0 otherwise.
<b><code>hatch[name].id</code></b>	unique identity number of the hatch in the model.
<b><code>hatch[id n].name</code></b>	name of the hatch that has the given identity number.
<b><code>hatch[name].cross</code></b>	1 if hatch is crossed; 0 otherwise.
<b><code>hatch[name].fill</code></b>	1 if hatch is filled; 0 otherwise.
<b><code>hatch[name].angle</code></b>	first angle of hatch.
<b><code>hatch[name].angle1</code></b>	first angle of hatch.
<b><code>hatch[name].angle2</code></b>	second angle of hatch.
<b><code>hatch[name].spacing</code></b>	spacing of hatch.
<b><code>hatch[name].boundaries</code></b>	number of boundaries enclosing the hatch.
<b><code>hatch[name].style.colour</code></b>	colour number of line style used to draw the hatch.
<b><code>hatch[name].style.color</code></b>	color (USA) number of line style used to draw the hatch.
<b><code>hatch[name].style.gap</code></b>	gap of line style used to draw the hatch.
<b><code>hatch[name].style.weight</code></b>	weight of line style used to draw the hatch.
<b><code>hatch[name].style.width</code></b>	width of line style used to draw the hatch.
<b><code>hatch[name].level</code></b>	level on which the hatch exists.

## Language command

Command	Description
<b><code>print language.summary</code></b>	the language and system locale settings being used by PowerShape.

## Level commands

### Command

**level.number**

**level[*number*].used**

**level[id *n*].name**

**level[*number*].active**

**level.filtered.number**

**level.filtered[*n*].index**

**level.filtered.used**

**level.filtered.named**

**level.filtered.on**

### Description

the number of used levels.

1 if the level is used; 0 otherwise.

name of the level that has the given identity number.

1 if the level is on; 0 otherwise.

number of filtered levels.

level number for the *n*th filtered level, where *n* is an integer between 0 to (level.filtered.number)-1.

1 if the **used** filter is set; 0 otherwise.

1 if the **named** filter is set; 0 otherwise.

1 if the **on** filter is set; 0 otherwise.

## Line commands

The following line commands are available:

### Command

**line[*name*].start**

**line[*name*].start.x**

**line[*name*].start.y**

**line[*name*].start.z**

**line[*name*].end**

**line[*name*].end.x**

**line[*name*].end.y**

**line[*name*].end.z**

**line[*name*].exists**

**line[*name*].id**

**line[id *n*].name**

**line[*name*].length**

**line[*name*].style.colour**

### Description

start coordinates [x, y, z] of the line.

x coordinate of the start of the line.

y coordinate of the start of the line.

z coordinate of the start of the line.

end coordinates [x, y, z] of the line.

x coordinate of the end of the line.

y coordinate of the end of the line.

z coordinate of the end of the line.

1 if line exists; 0 otherwise.

unique identity number of the line in the model.

name of the line that has the given identity number.

length of the line.

colour number of line style used to draw the line.

<b>line[<i>name</i>].style.color</b>	color (USA) number of line style used to draw the line.
<b>line[<i>name</i>].style.gap</b>	gap of line style used to draw the line.
<b>line[<i>name</i>].style.width</b>	width of line style used to draw the line.
<b>line[<i>name</i>].level</b>	level on which the line exists.
<b>item[<i>name</i>].style.pattern.start_mark</b>	name of the mark type at the start or end of the leader line item.
<b>item[<i>name</i>].style.pattern.end_mark</b>	

There are also commands to retrieve information on the angles of a line (see page 178).

## Angles of a line commands

Use the following variables to find the apparent and elevation angles of a line (these are the same values shown on the line editing form).

The commands return an absolute value, with the angle in the current units: degrees or radians.

### Command

### Description

**line[xxx].apparent**

returns the apparent angle of the line using the current working plane of the currently active workspace

**line[xxx].elevation**

returns the angle of elevation that the line makes using the current principal plane of the currently active workspace.

Optionally, you can specify which principal plane to use:

- **line[xxx].apparent.xy**
- **line[xxx].apparent.yz**
- **line[xxx].apparent.zx**
- **line[xxx].elevation.xy**
- **line[xxx].elevation.yz**
- **line[xxx].elevation.zx**

## Mesh commands

### Command

**mesh[*name*].level**

**mesh[*name*].exists**

**mesh[*name*].id**

**mesh[id *n*].name**

**mesh[*name*].style.colour**

**mesh[*name*].style.color**

**mesh[*name*].style.gap**

**mesh[*name*].style.weight**

**mesh[*name*].style.width**

**mesh[*name*].area**

**mesh[*name*].volume**

### Description

returns the level that the specified mesh is on.

1 if the mesh exists, 0 otherwise.

unique identity number of the mesh in the model.

name of the mesh that has the given identity number *n*.

colour number of line style used to draw the mesh.

color (USA) number of line style used to draw the mesh.

gap of line style used to draw the mesh.

weight of line style used to draw the mesh.

width of line style used to draw the mesh.

area of mesh.

volume of mesh.

## Mesh Doctor commands



***mesh\_doctor** can be used instead of **meshdoctor** for the following commands.*

### Command

### Description

**meshdoctor.stage**

prints the current stage: 1,2,3 or 4.

**meshdoctor.[*fault group*].[*fault.state*].number**

returns the total number of faults of the given group, in the given state.

**meshdoctor.[*fault group*].[*fault.state*].num\_selected**

returns the total number of faults of the given group, in the given state, that are currently selected.

**meshdoctor.[*fault group*].[*fault.state*][*n*].[*info*]**

reports information on the *n*th fault of the given group, in the given state.

**meshdoctor.[*fault*].available\_fixes.number**

returns the total number of available fixes for the given fault type.

**meshdoctor.[*fault*].available\_fixes[*n*].description**

returns a description of the *n*th fix available for the given fault type.

**meshdoctor.[*fault*].available\_fixes[*n*].name**

returns the name of the *n*th fix available for the given fault type.

**meshdoctor.[*fault*].[*fault.state*].number**

returns the total number of faults of the given type, that are in the given state.

**meshdoctor.[*fault*].[*fault.state*].num\_selected**

returns the number of selected faults of the given type, that are in the given state.

**meshdoctor.[*fault*].[*fault.state*][*n*].[*info*]**

reports information on the *n*th fault of the given type, that is in the given state.

**meshdoctor.[*tolerance.name*].tolerance**

returns the tolerance value.

**meshdoctor [*tolerance.name*]  
tolerance [*number*]**

sets the specified tolerance to the value given by *number*.  
This command can be called also outside the **Mesh Doctor** if a mesh is selected.

[*fault group*] can be: *all* (all faults), or *topological* (anything that is not a gap, partial gap, hole or intersection).

[*fault.state*] can be: *current\_faults* (the currently detected faults), *fixed\_faults* (faults fixed since the wizard was started), or *selected\_faults* (the currently selected faults).

[*info*] can be: *selected* (1 if the item is selected; 0 if not), *visible* (1 if the item is visible; 0 if not), *details* (name of the item), *fixes.number* (total number of possible fixes for this fault), *fixes[n].name* (name of nth fix for this fault), or *fixes[n].description* (description of the nth fix for this fault).

[*fault*] can be: *duplicate\_node/vertex* (two nodes or vertices closer than tolerance), *impossible\_edge* (an edge with more than 2 triangles attached), *reversed\_edge* (an edge with triangles attached that have different orientations), *gap* (a narrow hole, or a hole with a narrow section), *hole*, or *intersection* (overlapping triangles).

[*tolerance.name*] can be: *gap\_width* (the maximum width for a narrow hole to be considered a gap), *split\_edge* (a number  $\geq 0$  and  $< 1$  that is used by the algorithm that classifies narrow holes into gaps or holes), *zero\_area* (triangles whose area is smaller than this value are considered a fault), *hole\_fill* (the grid spacing to use when filling a hole), or *vertex\_distance* (vertices that are closer than this value are considered duplicate).

## Model commands

The following groups of model commands are available:

Command	Description
<b>model.selected</b>	name of the selected model.
<b>model[name].selected</b>	1 if the named model is selected; 0 otherwise.
<b>model[name].exists</b>	1 if the named model exists; 0 otherwise.
<b>model[name].id</b>	unique identity number of the model.
<b>model[id n].name</b>	name of the model that has the given identity number.
<b>model[name].open</b>	1 if the named model is open; 0 otherwise.

<b>model.lines</b>	number of objects in model
<b>model.arcs</b>	
<b>model.curves</b>	
<b>model.compcurves</b>	
<b>model-surfaces</b>	
<b>model.solids</b>	
<b>model.workplanes</b>	
<b>model.dimensions</b>	
<b>model.hatches</b>	
<b>model.symbols</b>	
<b>model.texts</b>	
<b>model.pcurves</b>	
<b>model.boundaries</b>	
<b>model.components</b>	
<b>model.filesize</b>	the size (in bytes) of the selected model's database.
<b>model[<i>name</i>].filesize</b>	the size (in bytes) of the named model's database. Note, if the model is not open, <b>model[<i>name</i>].filesize</b> is assigned -1.  The collective size of the model's files in its directory will be about 500 bytes larger. The size can be even larger if untruncated files exist. Use File > Info > Compress Model to truncate files as well as reducing the actual database size too.
<b>model[<i>name</i>].open.read</b>	1 if the named model has read access; 0 otherwise.
<b>model[<i>name</i>].open.write</b>	1 if the named model has write access; 0 otherwise.
<b>model.path</b>	pathname of the currently selected model.
<b>model[<i>name</i>].path</b>	pathname of the named model For example, <b>model[mouse].path</b> returns the pathname <a href="#">C:\Users\Public\Documents\Autodesk\Parts\m142</a> .
<b>model.locked</b>	1 if the currently selected model is locked; 0 otherwise.
<b>model[<i>name</i>].locked</b>	1 if the named model is locked; 0 otherwise.
<b>model.changed</b>	1 if the currently selected model has changed; 0 otherwise.



<b>model[<i>name</i>].changed</b>	1 if the named model has changed; 0 otherwise.
<b>model.corrupt</b>	1 if the currently selected model is corrupted; 0 otherwise.
<b>model[<i>name</i>].corrupt</b>	1 if the named model is corrupted; 0 otherwise.
<b>model.file_doctor.all</b>	number of errors found for general attributes, trimming, arcs and names.
<b>model.file_doctor.gen_attributes</b>	number of errors found for general attributes.
<b>model.file_doctor.deps</b>	number of errors found for dependencies.
<b>model.file_doctor.trimming</b>	number of errors found for trimming.
<b>model.file_doctor.arcs</b>	number of errors found for arcs.
<b>model.file_doctor.names</b>	number of errors found for names.
<b>model.file_doctor.solids</b>	returns the number of errors found by the File Doctor solid checker.
<b>model.file_doctor.orphans</b>	returns the number of errors found by the File Doctor orphaned items checker.
<b>model.version</b>	current model version
<b>model.previous_version</b>	version of model prior to upgrade when the model was opened
<b>model.upgraded</b>	1 if the model was upgraded on opening, 0 otherwise.

## Nesting

The following nesting commands are available:

Command	Description
<b>nestingex.num_parts</b>	number of unique Parts.
<b>nestingex.num_sheets</b>	number of unique Sheets.
<b>nestingex.item[<i>object name</i>].exists</b>	1 if Part or Sheet with the given name exists; 0 if not. For example: <b>nestingex.item["Solid 12"].exists</b>
<b>nestingex.item[<i>object name</i>].type</b>	whether the item with the given name is a Part or a Sheet. For example: <b>nestingex.item["Curve 14"].type</b>
<b>nestingex.part[<i>n number</i>].name</b>	name of the nth Part. For example: <b>nestingex.part[n 4].name</b>
<b>nestingex.sheet[<i>object name</i>].material_usage</b>	material usage of the Sheet with the given name. For example: <b>nestingex.sheet["Arc 20"].material_usage</b>
<b>nestingex.sheet[<i>object name</i>].number</b>	number of instances of the Sheet with the given name. For example: <b>nestingex.sheet["Curve 24"].number</b>
<b>nestingex.part[<i>n number</i>].num_colliding</b>	number of instances of the nth Part which are in collision. For example: <b>nestingex.part[n 0].num_colliding</b>
<b>nestingex.part[<i>object name</i>].instance[<i>n number</i>].selected</b>	whether the nth instance of the Part with the given name is selected. For example: <b>nestingex.part["Solid 5"].instance[n 3].selected</b>
<b>nestingex.part[<i>n number</i>].instance[<i>n number</i>].colliding</b>	whether the nth instance of the nth Part is in collision. For example: <b>nestingex.part[n 0].instance[n 3].colliding</b>

## Parameter command

### Command

**parameter**[*name*].value

**parameter**[*name*].exists

**parameter**[*name*].id

**parameter**[id *n*].name

**parameter.number**

### Description

value of parameter.

1 if parameter exists; 0 otherwise.

unique identity number of the parameter in the model.

name of the parameter that has the given identity number.

returns the number of non-hidden and non-automatic parameters in the model. This is the number of entries in the drop down list in the **Parameter Editor** dialog.

## Pcurve command

### Command

**pcurve**[*name*].exists

**pcurve**[*name*].number

**pcurve**[*name*].level

**pcurve**[*name*].closed

**pcurve**[*name*].id

**pcurve**[id *n*].name

**pcurve**[*name*].edge

**pcurve**[*name*].parent.name

**pcurve**[*name*].parent.id

**pcurve**[*name*].in\_boundary

**pcurve**[*name*].start

**pcurve**[*name*].start.xyz

### Description

1 if pcurve exists; 0 otherwise.

number of points in the pcurve.

level on which the pcurve exists.

1 if the pcurve is closed; 0 otherwise.

unique identity number of the pcurve in the model.

name of the pcurve that has the given identity number.

1 if the pcurve is on the edge of a surface; 0 otherwise.

name of the surface on which the pcurve lies.

unique identification number of the surface on which the pcurve lies.

1 if the pcurve exists in any boundary; 0 otherwise.

coordinates [x, y, z] of the start position in the pcurve.

coordinates [x, y, z] of the start position in the pcurve.

<b><code>pcurve[<i>name</i>].start.x</code></b>	x coordinate of the start position in the pcurve.
<b><code>pcurve[<i>name</i>].start.y</code></b>	y coordinate of the start position in the pcurve.
<b><code>pcurve[<i>name</i>].start.z</code></b>	z coordinate of the start position in the pcurve.
<b><code>pcurve[<i>name</i>].start.tu</code></b>	tu coordinates [t, u, 0] of the start position in the pcurve.
<b><code>pcurve[<i>name</i>].start.t</code></b>	t coordinate of the start position in the pcurve.
<b><code>pcurve[<i>name</i>].start.u</code></b>	u coordinate of the start position in the pcurve.
<b><code>pcurve[<i>name</i>].start.exists</code></b>	1 if the start coordinates of the pcurve exists; 0 otherwise.
<b><code>pcurve[<i>name</i>].end</code></b>	coordinates [x, y, z] of the end position in the pcurve.
<b><code>pcurve[<i>name</i>].end.xyz</code></b>	coordinates [x, y, z] of the end position in the pcurve.
<b><code>pcurve[<i>name</i>].end.x</code></b>	x coordinate of the end position in the pcurve.
<b><code>pcurve[<i>name</i>].end.y</code></b>	y coordinate of the end position of the pcurve.
<b><code>pcurve[<i>name</i>].end.z</code></b>	z coordinate of the end position in the pcurve.
<b><code>pcurve[<i>name</i>].end.tu</code></b>	tu coordinates [t, u, 0] of the end position in the pcurve.
<b><code>pcurve[<i>name</i>].end.t</code></b>	t coordinate of the end position in the pcurve.
<b><code>pcurve[<i>name</i>].end.u</code></b>	u coordinate of the end position in the pcurve.
<b><code>pcurve[<i>name</i>].end.exists</code></b>	1 if the end coordinates of the pcurve exists; 0 otherwise.
<b><code>pcurve[<i>name</i>].point[<i>number</i>]</code></b>	coordinates [x, y, z] of the pcurve's point.
<b><code>pcurve[<i>name</i>].point[<i>number</i>].xyz</code></b>	coordinates [x, y, z] of the pcurve's point.
<b><code>pcurve[<i>name</i>].point[<i>number</i>].x</code></b>	x coordinate of the pcurve's point.
<b><code>pcurve[<i>name</i>].point[<i>number</i>].y</code></b>	y coordinate of the pcurve's point.
<b><code>pcurve[<i>name</i>].point[<i>number</i>].z</code></b>	z coordinate of the pcurve's point.

<b>pcurve[<i>name</i>].point[<i>number</i>].tu</b>	tu coordinates [t, u, 0] of the pcurve's point.
<b>pcurve[<i>name</i>].point[<i>number</i>].t</b>	t coordinate of the pcurve's point.
<b>pcurve[<i>name</i>].point[<i>number</i>].u</b>	u coordinate of the pcurve's point.
<b>pcurve[<i>name</i>].point[<i>number</i>].exists</b>	1 if the pcurve's point exists; 0 otherwise.

## Point commands

### Command

**point[*name*].exists**

**point[*name*].id**

**point[id *n*].name**

**point[*name*].description**

**point[*name*].position**

**point[*name*].position.x**

**point[*name*].position.y**

**point[*name*].position.z**

**point[*name*].style.colour**

**point[*name*].style.color**

**point[*name*].style.gap**

**point[*name*].style.weight**

**point[*name*].style.width**

**point[*name*].level**

### Description

1 if the point exists; 0 otherwise.

unique identity number of the point in the model.

name of the point that has the given identity number.

description of the point as stored in the database.

coordinates [x, y, z] of the point.

x coordinate of the point.

y coordinate of the point.

z coordinate of the point.

colour number of line style used to draw the point.

color (USA) number of line style used to draw the point.

gap of line style used to draw the point.

weight of line style used to draw the point.

width of line style used to draw the point.

level on which the point exists.

## Printer commands

### Command

**printer[*name*].exists**

**printer[*name*].id**

**printer[id *n*].name**

**printer[*name*].image\_string\_set**

**printer[*name*].image\_string**

**printer[*name*].plot\_string\_set**

**printer[*name*].plot\_string**

**printer[*name*].initialised**

**printer[*name*].num\_pens**

**printer[*name*].pen[*n*].colour**

**printer[*name*].pen[*n*].width**

**printer[*name*].pen[*n*].active**

### Description

1 if the printer exists; 0 otherwise.

unique identity number of the printer.

name of the printer that has the given identity number.

1 if the image command is set; 0 otherwise.

image command for this printer.

1 if the plot command is set; 0 otherwise.

plot command for this printer.

1 if the printer is initialised; 0 otherwise.

number of pens stored for this printer.

colour number of pen *n* on this printer.

width of pen *n* on this printer.

1 if pen *n* is active; 0 otherwise.

## Renderer commands

### Command

**renderer.has\_hardware\_triangles**

**renderer.has\_depth\_cueing**

**renderer.has\_anti\_aliasing**

### Description

1 if the hardware supports triangles; 0 otherwise.

1 if the hardware supports depth cueing; 0 otherwise.

1 if the hardware supports anti-aliasing; 0 otherwise.

## Selection commands

### Command

**selection.exists**

**selection.id**

**selection.number**

**selection.magnitude**

**selection[*name*].description**

**SELECTION.TYPES**

**SELECTION.NAMES**

**selection.object[*number*]**

**selection.object[*number*].syntax**

### Description

1 if at least one item is selected; 0 otherwise.

unique identity number of the selection in the model.

number of selected items.

description of the selection as stored in the database.

returns a list of strings such as { 'Line'; 'Arc'; 'Solid' }; one string per selected item.

returns a list of strings such as { '1'; '1'; 'fred' }; one string per selected item.

object type and its name in the selection. For example, *Line[4]*, *Arc[1]*. If *n* items are selected, *number* is the item's number in the selection.

object information as specified by the *syntax* for object *selection.object[*number*]*. The *syntax* is given under each type of object.

For example, if **selection.object[1]** is *Line[2]*, then you can specify the *syntax* as any syntax after *Line[*name*]*. For further details, see *Line* (see page 177).

For the x coordinate of the start of the line, you can use **selection.object[1].start.x** where *start.x* is the syntax.

**selection.type[*number*]**

type of an object in the selection. For example, *Line*, *Arc*.

If *n* objects are selected, *number* is the item's number in the selection.

If you compare the type of an object with a text string, you must use the correct capitalisation. For example, to check that selection.type[0] is a composite curve, use:

**selection.type[0] == 'Composite Curve'**

not:

**selection.type[0] == 'Composite curve'**

**selection.type[0] == 'composite curve'**

**selection.name[*number*]**

name of an item in the selection.

If *n* items are selected, then *number* is the item's number in the selection.

In all cases, *number* is from 0 to (n-1).

**selection.size**

size of the bounding box around the selection.

**selection.size.x**

size in the x direction of the bounding box around the selection.

**selection.size.y**

size in the y direction of the bounding box around the selection.

**selection.size.z**

size in the z direction of the bounding box around the selection.

**selection.min\_range**

minimum coordinates of the bounding box around the selection.

**selection.min\_range.x**

x coordinate of the minimum coordinates of the bounding box around the selection.

**selection.min\_range.y**

y coordinate of the minimum coordinates of the bounding box around the selection.

**selection.min\_range.z**

z coordinate of the minimum coordinates of the bounding box around the selection.

**selection.max\_range**

maximum coordinates of the bounding box around the selection.

**selection.max\_range.x**

x coordinate of the maximum coordinates of the bounding box around the selection.



<b>selection.max_range.y</b>	y coordinate of the maximum coordinates of the bounding box around the selection.
<b>selection.max_range.z</b>	z coordinate of the maximum coordinates of the bounding box around the selection.
<b>selection.min_range_exact</b>	minimum coordinates of the bounding box around the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.min_range_exact.x</b>	x coordinate of the minimum coordinates of the bounding box around the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.min_range_exact.y</b>	y coordinate of the minimum coordinates of the bounding box around the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.min_range_exact.z</b>	z coordinate of the minimum coordinates of the bounding box around the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.max_range_exact</b>	maximum coordinates of the bounding box around the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.max_range_exact.x</b>	x coordinate of the maximum coordinates of the bounding box around the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.

<b>selection.max_range_exact.y</b>	y coordinate of the maximum coordinates of the bounding box around the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.max_range_exact.z</b>	z coordinate of the maximum coordinates of the bounding box around the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.size[n]</b>	size of the bounding box around the nth object in the selection.
<b>selection.size[n].x</b>	size in the x direction of the bounding box around the nth object in the selection.
<b>selection.size[n].y</b>	size in the y direction of the bounding box around the nth object in the selection.
<b>selection.size[n].z</b>	size in the z direction of the bounding box around the nth object in the selection.
<b>selection.min_range[n]</b>	minimum coordinates of the bounding box around the nth object in the selection.
<b>selection.min_range[n].x</b>	x coordinate of the minimum coordinates of the bounding box around the nth object in the selection.
<b>selection.min_range[n].y</b>	y coordinate of the minimum coordinates of the bounding box around the nth object in the selection.
<b>selection.min_range[n].z</b>	z coordinate of the minimum coordinates of the bounding box around the nth object in the selection.
<b>selection.max_range[n]</b>	maximum coordinates of the bounding box around the nth object in the selection.
<b>selection.max_range[n].x</b>	x coordinate of the maximum coordinates of the bounding box around the nth object in the selection.

<b>selection.max_range[n].y</b>	y coordinate of the maximum coordinates of the bounding box around the nth object in the selection.
<b>selection.max_range[n].z</b>	z coordinate of the maximum coordinates of the bounding box around the nth object in the selection.
<b>selection.min_range_exact[n]</b>	minimum coordinates of the bounding box around the nth object in the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.min_range_exact[n].x</b>	x coordinate of the minimum coordinates of the bounding box around the nth object in the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.min_range_exact[n].y</b>	y coordinate of the minimum coordinates of the bounding box around the nth object in the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.min_range_exact[n].z</b>	z coordinate of the minimum coordinates of the bounding box around the nth object in the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.max_range_exact[n]</b>	maximum coordinates of the bounding box around the nth object in the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.max_range_exact[n].x</b>	x coordinate of the maximum coordinates of the bounding box around the nth object in the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.

<b>selection.max_range_exact[n].y</b>	y coordinate of the maximum coordinates of the bounding box around the nth object in the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>selection.max_range_exact[n].z</b>	z coordinate of the maximum coordinates of the bounding box around the nth object in the selection. The bounding box ignores the centre of arcs and only takes into account the trimmed region of surfaces.
<b>surface.selected.curves</b>	Returns the number of currently selected surface curves (an <b>INT</b> ).
<b>surface.selected.points</b>	Returns the number of currently selected surface curve points (an <b>INT</b> ).

## Selection positions commands

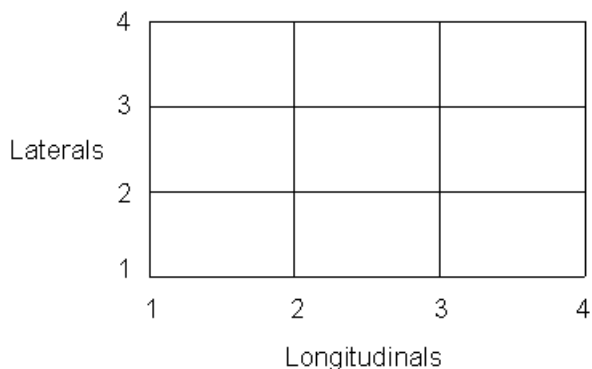
Currently, the selection position is only calculated when there is only one object in the selection. Therefore, the number in brackets [ ] is always zero.

### **selection.key\_point[0]**

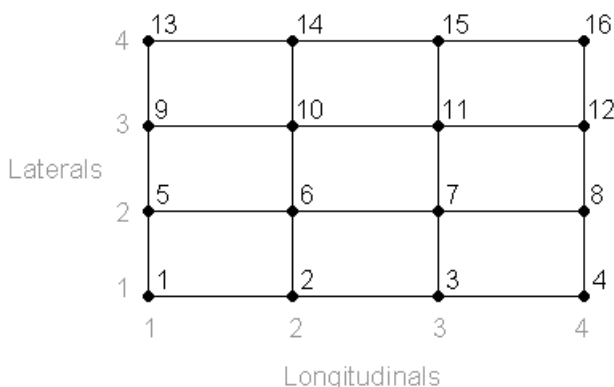
the number of the selected keypoint in a surface or curve.

For a curve, if the keypoint is the  $n$ th point, **selection.key\_point[0]** is  $n$ .

For a surface, the following surface describes how the numbers are identified.



The keypoints are numbered consecutively across the laterals as shown below.



If a spine point is selected, then **selection.key\_point[0]** is the number of points in the surface plus its number in the spine. For example, if a surface has 16 points and the third spine point is selected, then **selection.key\_point[0]** is 19.

### **selection.nearest\_end[0]**

the number of the end position nearest the position of selection in a line or arc, where 1 is the start point and 2 is the end point.

### **selection.composite\_item[0]**

the number of the object selected in a composite curve. If the third object in the composite curve is selected, then **selection.composite\_item[0]** is 3.

## Sharedddb command

### Command

**sharedddb.path**

### Description

pathname of the shared database being used, for example, C:\Users\Public\Documents\sharedddb.

## Sketcher command

### Command

**sketch**

### Description

1 if Sketcher is on; 0 otherwise.

## Solid commands

The following solid commands are available:

### Command

**solid[name].closest\_face(x; y; z)**

**solid[name].exists**

**XXXX[entity\_name].owner**

**XXXX[entity\_name].owner.id**

**XXXX[entity\_name].owner.name**

**XXXX[entity\_name].owner.type**

**solid\_active**

**solid.active**

**solid[name].id**

**solid[id n].name**

### Description

returns a string representing the name of the closest face of a solid to a given point. Enter the point in current units and absolute coordinates.

1 if the solid exists; 0 otherwise.

returns the Owner string

returns the Owner ID

returns the Owner Name

returns the Owner Type, where **XXXX** is a solid.

retrieves the id of the active solid.

returns the name of the currently active solid.

unique identity number of the solid in the model.

name of solid that has the given identity number.

<b>solid[<i>name</i>].child[<i>n</i>]</b>	returns a string representing the name of the numbered feature below the named solid.
	For example, <b>print solid[Fred].child[3]</b> returns the name of the 3rd feature from the top of the solid named Fred.
<b>feature[<i>name</i>].child[<i>n</i>]</b>	returns a string representing the name of the feature's numbered sub-branch, such as a Boolean feature.
<b>solid[<i>N</i>].parasolid</b>	returns <i>1</i> if the solid is a parasolid; <i>0</i> otherwise.
<b>solid[<i>N</i>].v8</b>	returns <i>1</i> if the solid is a version 8 solid; <i>0</i> otherwise.
<b>solid[<i>name</i>].active</b>	<i>1</i> if the solid is active; <i>0</i> otherwise.
<b>solid[<i>name</i>].ghost</b>	<i>1</i> for a ghost solid; <i>0</i> for a normal solid.
<b>solid[<i>name</i>].type</b>	checks the solid and retrieves one of the following strings: <ul style="list-style-type: none"> <li>▪ <i>Plane</i></li> <li>▪ <i>Block</i></li> <li>▪ <i>Sphere</i></li> <li>▪ <i>Cylinder</i></li> <li>▪ <i>Cone</i></li> <li>▪ <i>Torus</i></li> <li>▪ <i>Extrusion</i></li> <li>▪ <i>GeneralSolid</i></li> <li>▪ <i>Revolution</i></li> </ul>
<b>solid[<i>name</i>].surfaces</b>	number of surfaces in the solid.
<b>solid[<i>name</i>].surface[<i>number</i>]</b>	name of the surface in the solid.
<b>solid[<i>N</i>].surface[<i>M</i>].id</b>	returns the id number of the <b>M</b> th surface of solid <b>N</b> , or the representation number if a parasolid solid.
<b>solid[<i>N</i>].surface[<i>M</i>].name</b>	returns the name of the <b>M</b> th surface of solid <b>N</b> . This is the same as <b>solid[<i>N</i>].surface[<i>M</i>]</b> .
<b>solid[<i>name</i>].min_size</b>	minimum coordinates of the bounding box around the solid.
<b>solid[<i>name</i>].max_size</b>	maximum coordinates of the bounding box around the solid.
<b>solid[<i>name</i>].origin</b>	origin of the solid.

<b>solid[<i>name</i>].origin.x</b>	x coordinate of the origin of the solid.
<b>solid[<i>name</i>].origin.y</b>	y coordinate of the origin of the solid.
<b>solid[<i>name</i>].origin.z</b>	z coordinate of the origin of the solid.
<b>solid[<i>name</i>].radius</b>	radius of a cylinder or a sphere.
<b>solid[<i>name</i>].length</b>	length of one of the following primitives: block; cylinder; cone; extrusion; plane.
<b>solid[<i>name</i>].width</b>	width of a block or a plane.
<b>solid[<i>name</i>].diameter</b>	diameter of solid.
<b>solid[<i>name</i>].height</b>	height of a block.
<b>solid[<i>name</i>].neglength</b>	negative length of an extrusion
<b>solid[<i>name</i>].base_radius</b>	radius of a cone on the base of its workplane.
<b>solid[<i>name</i>].top_radius</b>	radius of a cone furthest from the base of its workplane.
<b>solid[<i>name</i>].major_radius</b>	major radius of a torus.
<b>solid[<i>name</i>].minor_radius</b>	minor radius of a torus.
<b>solid[<i>name</i>].draft_angle</b>	draft angle of an extrusion.
<b>solid[<i>name</i>].angle</b>	angle of primitive revolution
<b>solid[<i>name</i>].xaxis</b>	The following return the X, Y or Z unit axis vector of the primitive's workplane. The vector is defined in relation to the currently active workplane:
<b>solid[<i>name</i>].yaxis</b>	
<b>solid[<i>name</i>].zaxis</b>	
<b>solid[<i>name</i>].xaxis.x</b>	The following return the X, Y or Z entity of the unit axis vector of the primitive's workplane. The vector is defined in relation to the currently active workplane:
<b>solid[<i>name</i>].xaxis.y</b>	
<b>solid[<i>name</i>].xaxis.z</b>	
<b>solid[<i>name</i>].yaxis.x</b>	
<b>solid[<i>name</i>].yaxis.y</b>	
<b>solid[<i>name</i>].yaxis.z</b>	
<b>solid[<i>name</i>].zaxis.x</b>	
<b>solid[<i>name</i>].zaxis.y</b>	surface area of the solid.
<b>solid[<i>name</i>].zaxis.z</b>	
<b>solid[<i>name</i>].area</b>	
<b>solid[<i>name</i>].volume</b>	volume of the solid.
<b>solid[<i>name</i>].watertight</b>	1 if the solid is watertight within tolerance; 0 otherwise.
<b>solid[<i>name</i>].closed</b>	1 if the solid is closed; 0 otherwise.



<b>solid[<i>name</i>].cog</b>	coordinates [x, y, z] of the centre of gravity of the solid.
<b>solid[<i>name</i>].cog.x</b>	x coordinate of the centre of gravity of the solid.
<b>solid[<i>name</i>].cog.y</b>	y coordinate of the centre of gravity of the solid.
<b>solid[<i>name</i>].cog.z</b>	z coordinate of the centre of gravity of the solid.
<b>solid[<i>name</i>].moi</b>	coordinates [x, y, z] of the moment of inertia of the solid.
<b>solid[<i>name</i>].moi.x</b>	x coordinate of the moment of inertia of the solid.
<b>solid[<i>name</i>].moi.y</b>	y coordinate of the moment of inertia of the solid.
<b>solid[<i>name</i>].moi.z</b>	z coordinate of the moment of inertia of the solid.
<b>solid[<i>name</i>].nlinks</b>	number of linked half edges of a solid, where a half edge is a segment of a boundary of a face.
<b>solid[<i>name</i>].tolerance</b>	tolerance to which the half edges are known to link, where a half edge is a segment of a boundary of a face.
<b>solid[<i>name</i>].trimming_valid</b>	1 if boundaries in the solid are valid; 0 otherwise.
<b>solid[<i>name</i>].connected</b>	1 if the surfaces which define the solid connect together within tolerance; 0 otherwise.
<b>solid[<i>name</i>].material.polish</b>	polish value of the material used on the solid.
<b>solid[<i>name</i>].material.emission</b>	emission value of the material used on the solid.
<b>solid[<i>name</i>].material.transparency</b>	transparency value of the material used on the solid.
<b>solid[<i>name</i>].material.reflectance</b>	reflectance value of the material used on the solid.
<b>solid[<i>name</i>].material.colour</b>	rgb colour values of the material used on the solid.
<b>solid[<i>name</i>].material.name</b>	name of the material used for the solid.
<b>solid[<i>name</i>].style.colour</b>	colour number of line style used to draw the solid.

<b>solid[<i>name</i>].style.color</b>	color (USA) number of line style used to draw the solid.
<b>solid[<i>name</i>].style.gap</b>	gap of line style used to draw the solid.
<b>solid[<i>name</i>].style.weight</b>	weight of line style used to draw the solid.
<b>solid[<i>name</i>].style.width</b>	width of line style used to draw the solid.
<b>solid[<i>name</i>].level</b>	level on which the solid exists.
<b>solid.constraint.exists</b>	1 if scaling constraint exists; 0 otherwise.
<b>solid.constraint.type</b>	<i>Fixed Size</i> or <i>Fixed Distance</i> to indicate the type of scaling constraint.
<b>solid.constraint.origin</b>	the coordinates of the scaling constraint plane origin.
<b>solid.constraint.xaxis</b>	vector representing the X axis of the scaling constraint plane.
<b>solid.constraint.yaxis</b>	vector representing the Y axis of the scaling constraint plane.
<b>solid.constraint.zaxis</b>	vector representing the Z axis of the scaling constraint plane.

There are also commands to retrieve information about solid features (see page 200) and for picking faces of a solid (see page 205).

## Features commands

Command	Description
<b>solid[<i>name</i>].feature[<i>fname</i>].exists</b> <b>feature[<i>fname</i>].exists</b>	1 if the feature exists; 0 otherwise.
<b>solid[<i>name</i>].feature[<i>fname</i>].id</b> <b>feature[<i>fname</i>].id</b>	the integer id of the feature.
<b>solid[<i>name</i>].feature[<i>fname</i>].exists</b> <b>feature[<i>fname</i>].exists</b>	1 if the feature exists; 0 otherwise.
<b>solid[<i>name</i>].feature[<i>fname</i>].name</b> <b>feature[<i>fname</i>].name</b>	name of the feature.
<b>solid[<i>name</i>].feature[<i>fname</i>].type</b> <b>feature[<i>fname</i>].type</b>	type of feature (for example, "fillet", "boss").
<b>solid[<i>name</i>].feature[<i>fname</i>].suppressed</b> <b>feature[<i>fname</i>].suppressed</b>	1 if the feature currently suppressed; 0 otherwise.

<b>solid[name].feature[fname].error</b> <b>feature[fname].error</b>	1 if the feature error suppressed; 0 otherwise.
<b>solid[name].feature[fname].surfaces</b> <b>feature[fname].surfaces</b>	number of visible surfaces in the feature.
<b>solid[name].feature[fname].length</b> <b>feature[fname].length</b>	the length/depth/height of the cut/boss feature.
<b>solid[name].feature[fname].angle</b> <b>feature[fname].angle</b>	angle of the cut/boss/bulge feature.
<b>solid[name].feature[fname].radius</b> <b>feature[fname].radius</b>	radius of the fillet feature.

In addition, the following groups of feature commands are available:

- Holes (see page 201)
- Pockets and protrusions (see page 202)
- Number of features (see page 203)
- Workplane of feature (see page 203)
- Other feature commands (see page 204)

## Holes commands

Command	Description
<b>solid[name].feature[fname].origin</b>	origin of the hole
<b>solid[name].feature[fname].main_depth</b>	depth of the hole's main section
<b>solid[name].feature[fname].main_diameter</b>	diameter of the hole's main section
<b>solid[name].feature[fname].bore_depth</b>	depth of the hole's bore section (if any)
<b>solid[name].feature[fname].bore_diameter</b>	diameter of the hole's bore section (if any)
<b>solid[name].feature[fname].sink_diameter</b>	diameter of the hole's sink section (if any)
<b>solid[name].feature[fname].tap_depth</b>	depth of the hole's tap section (if any)
<b>solid[name].feature[fname].tap_diameter</b>	diameter of the hole's tap section (if any)
<b>solid[name].feature[fname].tap_pitch</b>	pitch of the hole's tap section (if any)

## ***Pockets and protrusions commands***

You can use the following commands to determine the dimensions of pockets and protrusions. The commands return the required dimension and take the form:

**`feature[name].length`**

The following commands are available for pockets and protrusions:

<b>Command</b>	<b>Description</b>
<b>length</b>	Length of the pocket
<b>width</b>	Width of the pocket
<b>height</b>	Height of the protrusion. This returns the same value as <b>depth</b>
<b>depth</b>	Depth of the pocket. This returns the same value as <b>height</b>
<b>angle1</b>	Draft angle of top wall
<b>angle2</b>	Draft angle of right wall
<b>angle3</b>	Draft angle of bottom wall
<b>angle4</b>	Draft angle of left wall
<b>radius</b>	Radius of joining fillet
<b>radius1</b>	Radius of top left corner fillet
<b>radius2</b>	Radius of top right corner fillet
<b>radius3</b>	Radius of bottom right corner fillet
<b>radius4</b>	Radius of bottom left corner fillet
<b>radius5</b>	Radius of base fillet of a pocket, or top fillet of a protrusion

You can use the existing hole commands to determine the dimensions of the hole in the corner(s) of the pocket. For example, the following command will return the main diameter of the hole in the corner of the pocket:

**`print feature[name].main_diameter`**

## Number of features commands

### Command

**solid[name].children**  
**solid[name].features**

**solid[name].children.all**  
**solid[name].features.all**

**solid[name].children.selected**  
**solid[name].features.selected**

**feature[name].children**  
**feature[name].features**

**feature[name].features.all**

### Description

number of features on the solid.

number of features on the solid, including sub-branches on the feature tree.

number of selected features on the solid.

number of features in the sub-branch. It can be used with Boolean and Group features.

number of features, including all sub-branches.

## Workplane of feature commands

### Command

**feature[name].xaxis**  
**feature[name].yaxis**  
**feature[name].zaxis**

**feature[name].xaxis.x**  
**feature[name].xaxis.y**  
**feature[name].xaxis.z**  
**feature[name].yaxis.x**  
**feature[name].yaxis.y**  
**feature[name].yaxis.z**  
**feature[name].zaxis.x**  
**feature[name].zaxis.y**  
**feature[name].zaxis.z**

### Description

return the X, Y or Z unit axis vector of the feature's workplane. The vector is relative to the currently active workplane.

return the X, Y or Z entity of the unit axis vector of the feature's workplane. The vector is relative to the currently active workplane.

For example:

```
print feature[1].xaxis  
print feature[1].xaxis.y
```

## Other feature commands

### Command

### Description

**feature[*name*].selected**

1 for a selected feature; 0 otherwise.

**feature[*name*].suppressed**

1 for suppressed feature; 0 otherwise.

**feature[*name*].error**

1 for an error state for a feature; 0 otherwise.

**feature[*name*].exists**

1 if the solid feature exists; 0 otherwise.

**feature[*name*].id**

unique identity number of the solid feature in the model.

**feature[id *n*].name**

name of solid feature that has the given identity number.

**feature[*name*].type**

checks the solid feature and retrieves a string indicating the type of feature.

**feature[*name*].surfaces**

number of visible surfaces that make up the feature.

**feature[*name of feature*].surface[*n*]**

the name of the *n*th surface of a solid feature, where *n* is the number of the surface of the solid feature.

**feature[*name*].length**

length of the feature - applies to cut and boss features only.

**feature[*name*].angle**

angle of the feature. Applies to cut, boss and bulge features only.

**feature[*name*].radius**

radius of feature. Applies to fillet feature only.

**feature[*feature name*].machine**

1 if feature is to be machined; 0 otherwise.

**feature[*feature name*].pre\_machined**

1 if feature is pre-machined; 0 otherwise.

**feature[*feature name*].existed\_at\_birth**

1 if feature was present in the original solid (for example, a feature existing in a manufacturer standard moldbase component); 0 if the feature was added later.

**feature.constraint.exists**

1 if scaling constraint exists; 0 otherwise.

**feature.constraint.type**

returns *Fixed Size* or *Fixed Distance* to indicate the type of scaling constraint.

<b>feature.constraint.origin</b>	returns the coordinates of the scaling constraint plane origin.
<b>feature.constraint.xaxis</b>	returns a vector representing the X axis of the scaling constraint plane.
<b>feature.constraint.yaxis</b>	returns a vector representing the Y axis of the scaling constraint plane.
<b>feature.constraint.zaxis</b>	returns a vector representing the Z axis of the scaling constraint plane.

## Picking faces of a solid commands

When in face selection mode, you can use commands to pick the faces of a selected solid.

Command	Description
<b>pick face name</b> <i>&lt;face_name&gt;</i>	Use these commands to replace the currently selected faces with named faces.  This is the same as using the mouse to select the faces.
<b>pick face</b> <i>&lt;face_name&gt;</i>	
<b>pick face replace name</b> <i>&lt;face_name&gt;</i>	
<b>pick face name</b> <i>&lt;face_name&gt;</i>	Use these commands to add the named face to the current selection.  This is the same as holding down the SHIFT key and left-clicking.
<b>pick face add name</b> <i>&lt;face_name&gt;</i>	
<b>pick face add</b> <i>&lt;face_name&gt;</i>	Use these commands to toggle the named face into/out of the current selection.  This is the same as holding down the CTRL key and left-clicking.
<b>pick face toggle name</b> <i>&lt;face_name&gt;</i>	
<b>pick face toggle</b> <i>&lt;face_name&gt;</i>	

*<face\_name>* can be a word, string, integer or variable. The following are valid:

- **pick face** *fred*
- **pick face** *'fred'*
- **pick face** *23*
- **string face\_name =** *'fred'*
- **pick face** *\$face\_name*

The commands are also available during the following operations:

- Multiple-face selection modes; if you are in convex face selection mode, several faces are selected, spreading out from the named face.
- **Solid Draft Face**
- **Solid Replace Face**
- **Solid Divide Face**

## Surface commands

The following surface commands are available:

Command	Description
<b>surface[name].exists</b>	1 if the surface exists; 0 otherwise.
<b>surface[name].id</b>	unique identity number of the surface in the model.
<b>surface[id n].name</b>	name of surface that has the given identity number.
<b>surface[name].description</b>	description of the surface as stored in the database
<b>surface[1].tangentpoint(1;2;3;4;5;6)</b>	A point on a surface such that if viewed from an outside point, the line joining the two points is tangent to the surface. The first three coordinates are a point outside the surface and the last three coordinates are the initial guess point on the surface.
<b>surface[name].direction</b>	unit vector of the reference direction of the surface.
<b>surface[name].direction.x</b>	x value of the unit vector of the reference direction of the surface.
<b>surface[name].direction.y</b>	y value of the unit vector of the reference direction of the surface.
<b>surface[name].direction.z</b>	z value of the unit vector of the reference direction of the surface.
<b>surface[name].trimmed</b>	1 if the surface's local trim flag is set; 0 otherwise.
<b>surface[name].min_size</b>	coordinates [x, y, z] of the minimum point of the smallest box that fully encloses the surface.



<b>surface[name].min_size.x</b>	x coordinate of the minimum point of the smallest box that fully encloses the surface.
<b>surface[name].min_size.y</b>	y coordinate of the minimum point of the smallest box that fully encloses the surface.
<b>surface[name].min_size.z</b>	z coordinate of the minimum point of the smallest box that fully encloses the surface.
<b>surface[name].max_size</b>	coordinates [x, y, z] of the maximum point of the smallest box that fully encloses the surface.
<b>surface[name].max_size.x</b>	x coordinate of the maximum point of the smallest box that fully encloses the surface.
<b>surface[name].max_size.y</b>	y coordinate of the maximum point of the smallest box that fully encloses the surface.
<b>surface[name].max_size.z</b>	z coordinate of the maximum point of the smallest box that fully encloses the surface.
<b>surface[name].type</b>	checks the surface and retrieves one of the following strings: <ul style="list-style-type: none"> <li>▪ <i>Plane</i></li> <li>▪ <i>Block</i></li> <li>▪ <i>Sphere</i></li> <li>▪ <i>Cylinder</i></li> <li>▪ <i>Cone</i></li> <li>▪ <i>Torus</i></li> <li>▪ <i>Extrusion</i></li> <li>▪ <i>Revolution</i></li> <li>▪ <i>Powersurface</i></li> <li>▪ <i>BCP</i></li> <li>▪ <i>NURB</i></li> <li>▪ <i>PDGS</i></li> </ul>
<b>surface[name].area</b>	area of the surface.
<b>surface[name].diameter</b>	diameter of surface.
<b>surface[name].volume</b>	volume of the surface.
<b>surface[name].cog</b>	coordinates [x, y, z] of the centre of gravity of the surface.

<b>surface[name].cog.x</b>	x coordinate of the centre of gravity of the surface.
<b>surface[name].cog.y</b>	y coordinate of the centre of gravity of the surface.
<b>surface[name].cog.z</b>	z coordinate of the centre of gravity of the surface.
<b>surface[name].evaluate(t; u).position</b>	coordinates [x, y, z] of the position on the surface defined by the t and u parameters.
<b>surface[name].evaluate(t; u).position.x</b>	x coordinate of the position defined on the surface by the t and u parameters.
<b>surface[name].evaluate(t; u).position.y</b>	y coordinate of the position defined on the surface by the t and u parameters.
<b>surface[name].evaluate(t; u).position.z</b>	z coordinate of the position defined on the surface by the t and u parameters.
<b>surface[name].evaluate(t; u).normal</b>	unit vector of the normal to the surface at the position defined by the t and u parameters.
<b>surface[name].evaluate(t; u).normal.x</b>	x value of the unit vector of the normal to the surface at the position defined by the t and u parameters.
<b>surface[name].evaluate(t; u).normal.y</b>	y value of the unit vector of the normal to the surface at the position defined by the t and u parameters.
<b>surface[name].evaluate(t; u).normal.z</b>	z value of the unit vector of the normal to the surface at the position defined by the t and u parameters.
<b>surface[name].evaluate(t; u).curvature.min</b>	minimum curvature at the position on the surface defined by the t and u parameters.
<b>surface[name].evaluate(t; u).curvature.max</b>	maximum curvature at the position on the surface defined by the t and u parameters.

**surface[name].near(x; y; z)**

t and u parameters on the surface nearest to the coordinates [x, y, z]. For complex surfaces, you can speed up calculations by supplying approximate t and u values that are close to the coordinates. The approximate values are added in brackets, as shown below:

**surface[name].near(x; y; z; guess\_t; guess\_u)**

**surface[name].near(x; y; z).t**

t parameter on the surface nearest to the coordinates [x, y, z].

**surface[name].near(x; y; z).u**

u parameter on the surface nearest to the coordinates [x, y, z].

**XXXX[entity\_name].owner**

returns the Owner string

**XXXX[entity\_name].owner.id**

returns the Owner ID

**XXXX[entity\_name].owner.name**

returns the Owner Name

**XXXX[entity\_name].owner.type**

returns the Owner Type, where **XXXX** is a surface.

**surface[name].material.polish**

polish value of the material used on the surface.

**surface[name].material.emission**

emission value of the material used on the surface.

**surface[name].material.transparency**

transparency value of the material used on the surface.

**surface[name].material.reflectance**

reflectance value of the material used on the surface.

**surface[name].material.colour**

RGB colour values of the material used on the surface.

**surface[name].material.name**

name of the material used for the surface.

**surface[name].trimming\_valid**

1 if the trim boundaries on the surface form a valid trim region; 0 otherwise.

**surface[name].boundaries**

number of boundaries on the surface.

**surface[name].pcurves**

number of pcurves on the surface.

<b>surface[<i>name</i>].pcurve[<i>number</i>]</b>	name of the pcurve on the surface. Each pcurve on the surface has a unique <i>number</i> , where <i>number</i> ranges from 1 to the value of surface[ <i>name</i> ].pcurves.
<b>surface[<i>name</i>].style.colour</b>	colour number of line style used to draw the surface if it is one of the basic 16 colours or -1 if it is an RGB colour. The following variables exist to check the RGB colour of items <b>surface[<i>name</i>].style.colour.red</b> <b>surface[<i>name</i>].style.colour.green</b> <b>surface[<i>name</i>].style.colour.blue</b> <b>surface[<i>name</i>].style.colour.rgb</b> <b>surface[<i>name</i>].style.colour.r</b> <b>surface[<i>name</i>].style.colour.g</b> <b>surface[<i>name</i>].style.colour.b</b>
<b>surface[<i>name</i>].style.color</b>	color (USA) number of line style used to draw the surface.
<b>surface[<i>name</i>].style.gap</b>	gap of line style used to draw the surface.
<b>surface[<i>name</i>].style.weight</b>	weight of line style used to draw the surface.
<b>surface[<i>name</i>].style.width</b>	width of line style used to draw the surface.
<b>surface[<i>name</i>].level</b>	level on which the surface exists.

You can also use the following groups of commands:

- Primitives (see page 211)
- Laterals (see page 213) and longitudinals (see page 215)
- Spines (see page 219)
- Number of selected surface curves/surface curve points (see page 189)

## Primitive commands

Surface syntax in this section applies to primitive surfaces (including extrusions). It outputs data about the surface's dimensions and workplane instrumentation.

### Command

### Description

**surface[*name*].radius**

radius of a cylinder or a sphere.

**surface[*name*].length**

length of one of the following primitives: block; cylinder; cone; extrusion; plane.

**surface[*name*].width**

width of a block or a plane.

**surface[*name*].height**

height of a block.

**surface[*name*].base\_radius**

radius of a cone on the base of its workplane.

**surface[*name*].top\_radius**

radius of a cone furthest from the base of its workplane.

**surface[*name*].major\_radius**

major radius of a torus.

**surface[*name*].minor\_radius**

minor radius of a torus.

**surface[*name*].neglength**

negative length of an extrusion.

**surface[*name*].draft\_angle**

draft angle of an extrusion.

**surface[*name*].origin**

coordinates [x, y, z] of the origin of the primitive's workplane instrumentation.

**surface[*name*].origin.x**

x coordinate of the origin of the primitive's workplane instrumentation.

**surface[*name*].origin.y**

y coordinate of the origin of the primitive's workplane instrumentation.

**surface[*name*].origin.z**

z coordinate of the origin of the primitive's workplane instrumentation.

**surface[*name*].xaxis**

unit vector which defines the orientation of the X-axis of the primitive's workplane instrumentation.

**surface[*name*].xaxis.x**

x value of the unit vector which defines the orientation of the X-axis of the primitive's workplane instrumentation.

**surface[*name*].xaxis.y**

y value of the unit vector which defines the orientation of the X-axis of the primitive's workplane instrumentation.

**surface[*name*].xaxis.z**

z value of the unit vector which defines the orientation of the X-axis of the primitive's workplane instrumentation.

<b>surface[<i>name</i>].yaxis</b>	unit vector which defines the orientation of the Y-axis of the primitive's workplane instrumentation.
<b>surface[<i>name</i>].yaxis.x</b>	x value of the unit vector which defines the orientation of the Y-axis of the primitive's workplane instrumentation.
<b>surface[<i>name</i>].yaxis.y</b>	y value of the unit vector which defines the orientation of the Y-axis of the primitive's workplane instrumentation.
<b>surface[<i>name</i>].yaxis.z</b>	z value of the unit vector which defines the orientation of the Y-axis of the primitive's workplane instrumentation.
<b>surface[<i>name</i>].zaxis</b>	unit vector which defines the orientation of the Z-axis of the primitive's workplane instrumentation.
<b>surface[<i>name</i>].zaxis.x</b>	x value of the unit vector which defines the orientation of the Z-axis of the primitive's workplane instrumentation.
<b>surface[<i>name</i>].zaxis.y</b>	y value of the unit vector which defines the orientation of the Z-axis of the primitive's workplane instrumentation.
<b>surface[<i>name</i>].zaxis.z</b>	z value of the unit vector which defines the orientation of the Z-axis of the primitive's workplane instrumentation.
<b>surface[<i>name</i>].xaxis</b> <b>surface[<i>name</i>].yaxis</b> <b>surface[<i>name</i>].zaxis</b>	return the X, Y or Z unit axis vector of the primitive's workplane. The vector is relative to the currently active workplane.
<b>surface[<i>name</i>].xaxis.x</b> <b>surface[<i>name</i>].xaxis.y</b> <b>surface[<i>name</i>].xaxis.z</b> <b>surface[<i>name</i>].yaxis.x</b> <b>surface[<i>name</i>].yaxis.y</b> <b>surface[<i>name</i>].yaxis.z</b> <b>surface[<i>name</i>].zaxis.x</b> <b>surface[<i>name</i>].zaxis.y</b> <b>surface[<i>name</i>].zaxis.z</b>	return the X, Y or Z entity of the unit axis vector of the primitive's workplane. The vector is relative to the currently active workplane.

## Surface lateral commands

### Command

### Description

<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>start</b>	coordinates [x, y, z] of the start position of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>start.x</b>	x coordinate of start position of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>start.y</b>	y coordinate of start position of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>start.z</b>	z coordinate of start position of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>end</b>	coordinates [x, y, z] of the end position of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>end.x</b>	x coordinate of end position of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>end.y</b>	y coordinate of end position of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>end.z</b>	z coordinate of end position of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>number</b>	number of points in the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>length</b>	length of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>length_between(a; b)</b>	length along the lateral between lateral points a and b.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>exists</b>	1 if lateral exists; 0 otherwise.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>id</b>	unique identity number of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>name</b>	name of the lateral.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>point[<i>number</i>]</b>	coordinates [x, y, z] of the position of the lateral's point.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>point[<i>number</i>].x</b>	x coordinate of the position of the lateral's point.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>point[<i>number</i>].y</b>	y coordinate of the position of the lateral's point.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>point[<i>number</i>].z</b>	z coordinate of the position of the lateral's point.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>point[<i>number</i>].entry_magnitude</b>	magnitude entering the lateral's point.
<b>surface</b> [ <i>name</i> ]. <b>lateral</b> [ <i>number</i> ]. <b>point[<i>number</i>].exit_magnitude</b>	magnitude leaving the lateral's point.

<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_tangent</b>	unit vector of the tangent direction entering the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_tangent.x</b>	x value of the unit vector which defines the tangent direction entering the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_tangent.y</b>	y value of the unit vector which defines the tangent direction entering the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_tangent.z</b>	z value of the unit vector which defines the tangent direction entering the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_tangent</b>	unit vector of the tangent direction leaving the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_tangent.x</b>	x value of the unit vector which defines the tangent direction leaving the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_tangent.y</b>	y value of the unit vector which defines the tangent direction leaving the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_tangent.z</b>	z value of the unit vector which defines the tangent direction leaving the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_tangent.azimuth</b>	azimuth angle of the tangent entering the point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_tangent.elevation</b>	elevation angle of the tangent entering the point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_tangent.azimuth</b>	azimuth angle of the tangent leaving the point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_tangent.elevation</b>	elevation angle of the tangent leaving the point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_normal</b>	unit vector of the normal entering the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_normal.x</b>	x value of the unit vector of the normal entering the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_normal.y</b>	y value of the unit vector of the normal entering the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_normal.z</b>	z value of the unit vector of the normal entering the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_normal</b>	unit vector of the normal leaving the lateral's point.



<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_normal.x</b>	x value of the unit vector of the normal leaving the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_normal.y</b>	y value of the unit vector of the normal leaving the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_normal.z</b>	z value of the unit vector of the normal leaving the lateral's point.
<b>surface[<i>name</i>].lateral[<i>number</i>].cog</b>	coordinates [x, y, z] of the centre of gravity of the lateral.
<b>surface[<i>name</i>].lateral[<i>number</i>].cog.x</b>	x coordinate of the centre of gravity of the lateral.
<b>surface[<i>name</i>].lateral[<i>number</i>].cog.y</b>	y coordinate of the centre of gravity of the lateral.
<b>surface[<i>name</i>].lateral[<i>number</i>].cog.z</b>	z coordinate of the centre of gravity of the lateral.
<b>surface[<i>name</i>].lat_closed</b>	1 if the surface's laterals are closed; 0 if open.
<b>surface[<i>name</i>].nlats</b>	number of laterals in the surface.
<b>surface[<i>name</i>].lateral.selected</b>	list of names of the currently selected laterals of the surface.
<b>surface[<i>name</i>].lateral[<i>number</i>].selected</b>	1 if lateral is selected; 0 if unselected.

## Surface longitudinal commands

Command	Description
<b>surface[<i>name</i>].longitudinal[<i>number</i>].start</b>	coordinates [x, y, z] of the start position of the longitudinal.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].start.x</b>	x coordinate of start position of the longitudinal.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].start.y</b>	y coordinate of start position of the longitudinal.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].start.z</b>	z coordinate of start position of the longitudinal.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].end</b>	coordinates [x, y, z] of the end position of the longitudinal.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].end.x</b>	x coordinate of end position of the longitudinal.

<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>end.y</b>	y coordinate of end position of the longitudinal.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>end.z</b>	z coordinate of end position of the longitudinal.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>number</b>	number of points in the longitudinal.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>length</b>	length of the longitudinal.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>length_between(a; b)</b>	length along the longitudinal between longitudinal points a and b.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>exists</b>	1 if longitudinal exists; 0 otherwise.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>id</b>	unique identity number of the longitudinal.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>name</b>	name of the longitudinal.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>point</b> [ <i>number</i> ]	coordinates [x, y, z] of the position of the longitudinal's point.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>point</b> [ <i>number</i> ]. <b>x</b>	x coordinate of the position of the longitudinal's point.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>point</b> [ <i>number</i> ]. <b>y</b>	y coordinate of the position of the longitudinal's point.
<b>surface</b> [ <i>name</i> ]. <b>longitudinal</b> [ <i>number</i> ]. <b>point</b> [ <i>number</i> ]. <b>z</b>	z coordinate of the position of the longitudinal's point.
<b>surface</b> [ <i>entity_name</i> ]. <b>evaluate</b> ( <i>T; U</i> ). <b>udirb</b>	tangent vector U, direction before/after (around lateral) of the specified (T,U) point on the surface.
<b>surface</b> [ <i>entity_name</i> ]. <b>evaluate</b> ( <i>T; U</i> ). <b>udira</b>	
<b>surface</b> [ <i>entity_name</i> ]. <b>evaluate</b> ( <i>T; U</i> ). <b>tdirb</b>	tangent vector T, direction before/after (along longitudinal) of the specified (T,U) point on the surface .
<b>surface</b> [ <i>entity_name</i> ]. <b>evaluate</b> ( <i>T; U</i> ). <b>tdira</b>	
<b>surface</b> [ <i>entity_name</i> ]. <b>evaluate</b> ( <i>T; U</i> )	coordinates of the specified (T,U) point on the surface .
<b>surface</b> [ <i>entity_name</i> ]. <b>evaluate</b> ( <i>T; U</i> ). <b>position</b>	coordinates of the specified (T,U) point on the surface.
<b>surface</b> [ <i>entity_name</i> ]. <b>evaluate</b> ( <i>T; U</i> ). <b>normal</b>	normal direction of the specified (T,U) point on the surface.
<b>surface</b> [ <i>entity_name</i> ]. <b>evaluate</b> ( <i>T; U</i> ). <b>draft_angle</b>	draft angle of the surface at specified (T,U) point.

<b>surface[entity_name].evaluate(T; U).curvature.min</b>	minimum curvature of the surface at specified (T,U) point.
<b>surface[entity_name].evaluate(T; U).cuvature.max</b>	maximum curvature of the surface at specified (T,U) point.
<b>surface[name].longitudinal[number].point[number].entry_magnitude</b>	magnitude entering the longitudinal's point.
<b>surface[name].longitudinal[number].point[number].exit_magnitude</b>	magnitude leaving the longitudinal's point.
<b>surface[name].longitudinal[number].point[number].entry_tangent</b>	unit vector of the tangent direction entering the longitudinal's point.
<b>surface[name].longitudinal[number].point[number].entry_tangent.x</b>	x value of the unit vector which defines the tangent direction entering the longitudinal's point.
<b>surface[name].longitudinal[number].point[number].entry_tangent.y</b>	y value of the unit vector which defines the tangent direction entering the longitudinal's point.
<b>surface[name].longitudinal[number].point[number].entry_tangent.z</b>	z value of the unit vector which defines the tangent direction entering the longitudinal's point.
<b>surface[name].longitudinal[number].point[number].exit_tangent</b>	unit vector of the tangent direction leaving the longitudinal's point.
<b>surface[name].longitudinal[number].point[number].exit_tangent.x</b>	x value of the unit vector which defines the tangent direction leaving the longitudinal's point.
<b>surface[name].longitudinal[number].point[number].exit_tangent.y</b>	y value of the unit vector which defines the tangent direction leaving the longitudinal's point.
<b>surface[name].longitudinal[number].point[number].exit_tangent.z</b>	z value of the unit vector which defines the tangent direction leaving the longitudinal's point.
<b>surface[name].longitudinal[number].point[number].entry_tangent.azimuth</b>	azimuth angle of the tangent entering the point.
<b>surface[name].longitudinal[number].point[number].entry_tangent.elevation</b>	elevation angle of the tangent entering the point.
<b>surface[name].longitudinal[number].point[number].exit_tangent.azimuth</b>	azimuth angle of the tangent leaving the point.
<b>surface[name].longitudinal[number].point[number].exit_tangent.elevation</b>	elevation angle of the tangent leaving the point.

<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].entry_normal</b>	unit vector of the normal entering the longitudinal's point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].entry_normal.x</b>	x value of the unit vector of the normal entering the longitudinal's point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].entry_normal.y</b>	y value of the unit vector of the normal entering the longitudinal's point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].entry_normal.z</b>	z value of the unit vector of the normal entering the longitudinal's point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].exit_normal</b>	unit vector of the normal leaving the longitudinal's point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].exit_normal.x</b>	x value of the unit vector of the normal leaving the longitudinal's point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].exit_normal.y</b>	y value of the unit vector of the normal leaving the longitudinal's point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].exit_normal.z</b>	z value of the unit vector of the normal leaving the longitudinal's point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].cog</b>	coordinates [x, y, z] of the centre of gravity of the longitudinal.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].cog.x</b>	x coordinate of the centre of gravity of the longitudinal.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].cog.y</b>	y coordinate of the centre of gravity of the longitudinal.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].cog.z</b>	z coordinate of the centre of gravity of the longitudinal.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_tangent.flare</b>	flare angle of the longitudinal entering the point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].entry_tangent.twist</b>	twist angle of the longitudinal entering the point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_tangent.flare</b>	flare angle of the longitudinal leaving the point.
<b>surface[<i>name</i>].lateral[<i>number</i>].point[<i>number</i>].exit_tangent.twist</b>	twist angle of the longitudinal leaving the point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].entry_tangent.flare</b>	flare angle entering the point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].entry_tangent.twist</b>	twist angle entering the point.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].exit_tangent.flare</b>	flare angle leaving the point.

<b>surface[<i>name</i>].longitudinal[<i>number</i>].point[<i>number</i>].exit_tangent.twist</b>	twist angle leaving the point.
<b>surface[<i>name</i>].lon_closed</b>	1 if the surface's longitudinals are closed; 0 if open.
<b>surface[<i>name</i>].nlons</b>	number of longitudinals in the surface.
<b>surface[<i>name</i>].longitudinal.selected</b>	list of names of the currently selected laterals or longitudinals of the surface.
<b>surface[<i>name</i>].longitudinal[<i>number</i>].selected</b>	1 if lateral or longitudinal is selected; 0 if unselected.

## Spine commands

### Command

**surface[*name*].spine.exists**  
**surface[*name*].spine.id**  
**surface[*id n*].spine.name**  
  
**surface[*name*].spine.number**  
**surface[*name*].spine.length**  
**surface[*name*].spine.length\_between(*a*; *b*)**  
**surface[*name*].spine.start**  
**surface[*name*].spine.start.x**  
**surface[*name*].spine.start.y**  
**surface[*name*].spine.start.z**  
**surface[*name*].spine.end**  
**surface[*name*].spine.end.x**  
**surface[*name*].spine.end.y**  
**surface[*name*].spine.end.z**  
**surface[*name*].spine.point[*number*]**  
**surface[*name*].spine.point[*number*].x**  
**surface[*name*].spine.point[*number*].y**  
**surface[*name*].spine.point[*number*].z**  
**surface[*name*].spine.point[*number*].tangent**

### Description

1 if the spine exists; 0 otherwise.  
unique identity number of the spine.  
name of the spine that has the given identity number.  
  
number of spine points.  
length of the spine.  
length along the spine between spine points *a* and *b*.  
start coordinates [*x*, *y*, *z*] of the spine.  
*x* coordinate of the start of the spine.  
*y* coordinate of the start of the spine.  
*z* coordinate of the start of the spine.  
end coordinates [*x*, *y*, *z*] of the spine.  
*x* coordinate of the end of the spine.  
*y* coordinate of the end of the spine.  
*z* coordinate of the end of the spine.  
coordinates [*x*, *y*, *z*] of the spine point.  
*x* coordinate of the spine point.  
*y* coordinate of the spine point.  
*z* coordinate of the spine point.  
unit vector of the tangent direction through the spine point.

<b>surface[<i>name</i>].spine.point[<i>number</i>].tangent.x</b>	x value of the unit vector of the tangent direction through the spine point.
<b>surface[<i>name</i>].spine.point[<i>number</i>].tangent.y</b>	y value of the unit vector of the tangent direction through the spine point.
<b>surface[<i>name</i>].spine.point[<i>number</i>].tangent.z</b>	z value of the unit vector of the tangent direction through the spine point.
<b>surface[<i>name</i>].spine.point[<i>number</i>].entry_tangent.azimuth</b>	azimuth angle of the tangent entering the spine point.
<b>surface[<i>name</i>].spine.point[<i>number</i>].entry_tangent.elevation</b>	elevation angle of the tangent entering the spine point.
<b>surface[<i>name</i>].spine.point[<i>number</i>].exit_tangent.azimuth</b>	azimuth angle of the tangent leaving the spine point.
<b>surface[<i>name</i>].spine.point[<i>number</i>].exit_tangent.elevation</b>	elevation angle of the tangent leaving the spine point.

## Symbol commands

The following symbol commands are available:

Command	Description
<b>symbol[<i>name</i>].exists</b>	1 if the symbol exists; 0 otherwise.
<b>symbol[<i>name</i>].id</b>	unique identity number of the symbol in the model.
<b>symbol[id <i>n</i>].name</b>	name of the symbol that has the given identity number.
<b>symbol[<i>name</i>].position[<i>pin number</i>]</b>	coordinates [x, y, z] of the named pin.
<b>symbol[<i>name</i>].position[<i>pin number</i>].x</b>	x coordinate of the named pin.
<b>symbol[<i>name</i>].position[<i>pin number</i>].y</b>	y coordinate of the named pin.
<b>symbol[<i>name</i>].position[<i>pin number</i>].z</b>	z coordinate of the named pin.
<b>symbol[<i>name</i>].number</b>	number of pins in the symbol.
<b>symbol[<i>name</i>].style.colour</b>	colour number of line style used to draw the symbol.
<b>symbol[<i>name</i>].style.color</b>	color (USA) number of line style used to draw the symbol.
<b>symbol[<i>name</i>].style.gap</b>	gap of line style used to draw the symbol.

<b>symbol[<i>name</i>].style.weight</b>	weight of line style used to draw the symbol.
<b>symbol[<i>name</i>].style.width</b>	width of line style used to draw the symbol.
<b>symbol[<i>name</i>].level</b>	level on which the symbol exists.
<b>symbol[<i>name</i>].area</b>	area of triangulated symbols.
<b>symbol[<i>name</i>].volume</b>	volume of triangulated symbols.
<b>symbol.constraint.exists</b>	1 if scaling constraint exists; 0 otherwise.
<b>symbol.constraint.type</b>	<i>Fixed Size</i> or <i>Fixed Distance</i> to indicate the type of scaling constraint.
<b>symbol.constraint.origin</b>	the coordinates of the scaling constraint plane origin.
<b>symbol.constraint.xaxis</b>	a vector representing the X axis of the scaling constraint plane.
<b>symbol.constraint.yaxis</b>	a vector representing the Y axis of the scaling constraint plane.
<b>symbol.constraint.zaxis</b>	a vector representing the Z axis of the scaling constraint plane.
<b>symbol_def[<i>name</i>].exists</b>	1 if the symbol definition exists; 0 otherwise.
<b>symbol_def[<i>name</i>].id</b>	unique identity number for the symbol definition.
<b>symbol_def[id <i>n</i>].name</b>	name of the symbol definition that has the given identity number.



## Text commands

### Command

**text[*name*].exists**

**text[*name*].id**

**text[id *n*].name**

**text[*name*].string**

**text[*name*].livetext**

**text[*name*].colour**

**text[*name*].level**

**text[*name*].string.unstripped**

**text[*text\_name*].string.unstripped.length**

**text[*text\_name*].string.unstripped.char[*ipos*]**

**text[*name*].string.stripped**

**text[*text\_name*].string.stripped.length**

**text[*text\_name*].string.stripped.char[*ipos*]**

**text[*text\_name*].string.stripped.locate[*string*]**

**text[*name*].font**

### Description

1 if the text exists; 0 otherwise.

unique identity number of the text in the model.

name of the text that has the given identity number.

text string.

1 if text created using PowerShape standard text editor; 0 for DUCT editor.

number of the colour used by the text.

level on which the text exists.

text string with format characters.

returns length of unstripped text.

returns the character at the specified position in unstripped text string, where *ipos* is greater or equal to 0 and less than the string length

text string without format characters.

returns length of stripped text.

returns the character at the specified position in stripped text string, where *ipos* is greater or equal to 0 and less than the string length.

returns the location of *string* in stripped text string. If *string* isn't found, -1 is returned.

name of the font used by the text.



<b>text[name].origin</b>	the origin of the text is output as one of the following strings: <ul style="list-style-type: none"> <li>▪ <i>Bottom Left</i></li> <li>▪ <i>Bottom Centre</i></li> <li>▪ <i>Bottom Right</i></li> <li>▪ <i>Centre Left</i></li> <li>▪ <i>Centre</i></li> <li>▪ <i>Centre Right</i></li> <li>▪ <i>Top Left</i></li> <li>▪ <i>Top Centre</i></li> <li>▪ <i>Top Right</i></li> </ul>
<b>text[name].position</b>	coordinates [x, y, z] of the position at which the text was placed.
<b>text[name].position.x</b>	x coordinate of the position at which the text was placed.
<b>text[name].position.y</b>	y coordinate of the position at which the text was placed.
<b>text[name].position.z</b>	z coordinate of the position at which the text was placed.
<b>text[name].char_height</b>	height of the characters.
<b>text[name].char_spacing</b>	spacing between individual characters (pitch).
<b>text[name].angle</b>	angle of the text.
<b>text[name].line_spacing</b>	spacing between lines of text.
<b>text[name].justification</b>	justification of the text is output as one of the following strings: <ul style="list-style-type: none"> <li>▪ <i>Left</i></li> <li>▪ <i>Centre</i></li> <li>▪ <i>Right</i></li> </ul>
<b>text[name].horizontal</b>	1 if text characters are horizontal; 0 otherwise.
<b>text[name].italic</b>	1 if text is italic; 0 otherwise.

## Tolerance commands

### Command

**tolerance.general**

**tolerance.drawing**

### Description

value of general tolerance.

value of drawing tolerance.

## Units commands

### Command

**unit[type].name**

**unit[type].factor**

### Description

name of the units for type. For example, type length's output can be mm.

number by which the default unit is multiplied by to give the units in unit[type].name.

For example, type **length** has default units *mm*. If **unit[length].name** is *inches*, then the **unit[length].factor** is *0.039370*.

## Updated object commands

You can use these commands to query which objects were updated as a result of the last operation. These objects are accessed from the updated list.

### Command

**updated.exists**

**Updated.clearlist**

**updated.number**

**updated.object[*number*]**

### Description

1 if at least one item is in the updated list; 0 otherwise.

objects are removed from the updated list.

number of items in the updated list.

object type and its name in the updated list. For example, *Line[4]*, *Arc[1]*.

If *n* items are updated, then *number* is the item's number in the updated list.

**updated.object[*number*].syntax**

object information as specified by the *syntax* for **object updated.object[*number*]**. The *syntax* you can use is given under each type of object.

For example, if **updated.object[1]** is *Line[2]*, then you can specify the *syntax* as any syntax after **Line[*name*]**. For further details see Line (see page 177). For the x coordinate of the start of the line, you can use **updated.object[1].start.x** where **start.x** is the syntax.

**updated.type[*number*]**

type of an object in the updated list. For example, *Line*, *Arc*.

If *n* objects are updated, then *number* is the item's number in the updated list.

When you compare the type of an object with a text string, you must use the correct capitalisation. For example, to check that **updated.type[0]** is a composite curve, use:

**updated.type[0] == 'Composite Curve'**

not:

**updated.type[0] == 'Composite curve'**

**updated.type[0] == 'composite curve'**

**updated.name[*number*]**

name of an item in the updated list.

If *n* items are updated, then *number* is the item's number in the updated list.

In all cases *number* is from 0 to (*n*-1).

## User commands

Command	Description
<b>user</b>	details of the user currently using PowerShape. It is output in the following form: user login : user name : start macro : security level
<b>user.login</b>	login of the user currently using PowerShape.
<b>user.name</b>	name of the user currently using PowerShape.
<b>user.macro</b>	pathname of the login macro of the user currently using PowerShape.
<b>user.security</b>	security level of the current user using PowerShape.

## Product version commands

Command	Description
<b>version</b>	version of PowerShape that is being used, for example, 18121.
<b>version.major</b>	first digits of the version of PowerShape being used. For example, if you are using 18121, version.major returns 18.
<b>version.minor</b>	middle digit of the version of PowerShape being used. For example, if you are using 18121, version.minor returns 1.
<b>version.revision</b>	last two digits of the version of PowerShape being used. For example, if you are using 18121, version.revision returns 21.
<b>version.has.excel</b>	tests if MS Excel is installed.

## View commands

### Command

**view[*name*].exists**

**view[*name*].id**

**view[id *n*].name**

**view[*name*].rotation\_centre**

**view[*name*].rotation\_centre.x**

**view[*name*].rotation\_centre.y**

**view[*name*].rotation\_centre.z**

### Description

1 if the view exists; 0 otherwise.

unique identity number of the view.

name of the view that has the given identity number.

[x y z] coordinates of the rotation centre of the view.

x coordinate of the rotation centre of the view.

y coordinate of the rotation centre of the view.

z coordinate of the rotation centre of the view.

## Window commands

### Command

**cwindow clear**

**window.selected**

**window.number**

**window[*name*].exists**

**window[*name*].id**

**window[*name*].size**

**window[*name*].size.x**

**window[*name*].size.y**

**window[*name*].type**

**window[*name*].model**

**window[*name*].drawing**

### Description

clears the Command window.

number of the selected window.

number of windows opened.

1 if the window exists; 0 otherwise.

unique identity number of the window.

size of the window in x and y.

size of the window in x.

size of the window in y.

type of the window from one of the following: model or drawing.

name of the model opened in the window.

name of the drawing if opened in the window and a blank string otherwise.

## Workplane commands

If you don't specify the name of the workplane, the active workplane is used; for example, **workplane.origin** returns the origin of the active workplane. An error is displayed when there is no active workplane.

The following workplane commands are available:

Command	Description
<b>workplane[<i>name</i>].active</b>	1 if the workplane is active; 0 otherwise.
<b>workplane.active</b>	name of the active workplane. If no workplane is active, <i>World</i> is returned, even in a foreign language.
<b>workplane[<i>name</i>].xaxis</b>	unit vector which defines the orientation of the X-axis of workplane from its origin.
<b>workplane[<i>name</i>].xaxis.x</b>	x value of the unit vector which defines the orientation of the X-axis of workplane from its origin.
<b>workplane[<i>name</i>].xaxis.y</b>	y value of the unit vector which defines the orientation of the X-axis of workplane from its origin.
<b>workplane[<i>name</i>].xaxis.z</b>	z value of the unit vector which defines the orientation of the X-axis of workplane from its origin.
<b>workplane[<i>name</i>].yaxis</b>	unit vector which defines the orientation of the Y-axis of workplane from its origin.
<b>workplane[<i>name</i>].yaxis.x</b>	x value of the unit vector which defines the orientation of the Y-axis of workplane from its origin.
<b>workplane[<i>name</i>].yaxis.y</b>	y value of the unit vector which defines the orientation of the Y-axis of workplane from its origin.
<b>workplane[<i>name</i>].yaxis.z</b>	z value of the unit vector which defines the orientation of the Y-axis of workplane from its origin.
<b>workplane[<i>name</i>].zaxis</b>	unit vector which defines the orientation of the Z-axis of workplane from its origin.
<b>workplane[<i>name</i>].zaxis.x</b>	x value of the unit vector which defines the orientation of the Z-axis of workplane from its origin.

<b>workplane[<i>name</i>].zaxis.y</b>	y value of the unit vector which defines the orientation of the Z-axis of workplane from its origin.
<b>workplane[<i>name</i>].zaxis.z</b>	z value of the unit vector which defines the orientation of the Z-axis of workplane from its origin.
<b>workplane[<i>name</i>].exists</b>	1 if the workplane exists; 0 otherwise.
<b>workplane[<i>name</i>].id</b>	unique identity number of the workplane in the model.
<b>workplane[id <i>n</i>].name</b>	name of the workplane that has the given identity number.
<b>workplane[<i>name</i>].level</b>	level on which the workplane exists.
<b>workplane[<i>name</i>].locked</b>	1 if the workplane is locked; 0 otherwise.
<b>workplane[<i>name</i>].origin</b>	coordinates [x, y, z] of the origin of the workplane.
<b>workplane[<i>name</i>].origin.x</b>	x coordinate of the origin of the workplane.
<b>workplane[<i>name</i>].origin.y</b>	y coordinate of the origin of the workplane.
<b>workplane[<i>name</i>].origin.z</b>	z coordinate of the origin of the workplane.
<b>workplane[<i>name</i>].style.colour</b>	colour number of line style used to draw the workplane.
<b>workplane[<i>name</i>].style.color</b>	color (USA) number of line style used to draw the workplane.
<b>workplane[<i>name</i>].style.gap</b>	gap of line style used to draw the workplane.
<b>workplane[<i>name</i>].style.weight</b>	weight of line style used to draw the workplane.
<b>workplane[<i>name</i>].style.width</b>	width of line style used to draw the workplane.





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