AVEVA PLANT

Software Customisation Reference Manual

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Software Customisation Reference Manual

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Reference Manual

1 Introduction

This manual is the Reference Manual for the AVEVA Programming Language, PML.

It is intended for users who are already familiar with PML. Users who are starting to use PML should refer to the *Software Customisation Guide*, which should be used together with this manual.

There are two versions of PML, the older one, known as PML 1, and the newer one, known as PML 2. PML 2 has been written specifically for creating and customising the AVEVA GUI, and this manual is mainly concerned with PML 2.

However, PML 2 has not completely replaced PML 1, and there are some tasks which are carried out more efficiently using PML 1 facilities. In particular, this manual describes the PML 1 expressions package, which is used within PDMS; for example, for writing rules and defining report templates. You should also refer to the *Database Management Reference Manual*.

This manual contains:

- A list of PML 2 Objects, Members and Methods. For the Forms and Menus objects, the command syntax relating to the objects is included.

Note: Many properties of Forms and Gadgets that were previously set using commands should now be set using the Form or Gadget methods. In general, the only commands described are those which have not been replaced by methods. If you are maintaining old code, you may need to refer to the edition of the AVEVA Software Customisation Guide dated October 1995, which describes the old syntax in detail.

- Information about using PML in Review.
- A description of the PML 1 expressions package.

2 Summary of Objects, Members and Methods

2.1 Object Classification

The table below lists the object types and shows which classifications they belong to.

Classification	Object Type
`PML Built-in Objects`	ARRAY
	BLOCK
	BOOLEAN
	FILE
	OBJECT
	REAL
	STRING
	DATETIME
`3D Geometry Objects`	ARC
	LINE
	LINEARGRID
	LOCATION
	PLANE
	PLANTGRID
	POINTVECTOR
	POSTEVENTS
	PROFILE
	RADIAL GRID
	XYPOSITION

Classification	Object Type
PDMS Objects	BANNER
	BORE
	DB
	DBREF
	DBSESS
	DIRECTION
	MACRO
	MDB
	ORIENTATION
	POSITION
	POSTUNDO
	PROJECT
	SESSION
	TEAM
	UNDOABLE
	USER
Forms and Menu Objects & Gadgets	ALERT
	BAR
	BUTTON
	COMBOBOX
	CONTAINER
	FMSYS
	FORM
	FRAME
	LINE
	LIST
	MENU
	NUMERIC
	OPTION
	PARAGRAPH
	RTOGGLE
	SELECTOR

Classification	Object Type	
	SLIDER	
	TEXT	
	TEXTPANE	
	TOGGLE	
	VIEW	ALPHA
		AREA
		PLOT
		VOLUME
`Collection and Report Objects`	COLLECTION	
	COLUMN	
	COLUMN-FORMAT	
	DATE-FORMAT	
	EXPRESSION	
	REPORT	
	TABLE	
`Formatting Text`	FORMAT	

Table 2: 1. Object Types and Classification

2.2 Methods Available to All Objects

The table following lists the methods available to all objects. The table gives the name of each method and the type of result you get back from it.

The third column of the table describes what the method does.

Name	Result	Purpose
`Attribute( 'Name')`	ANY	To set or get a member of an object, providing the member name as a STRING.
`Attributes()`	ARRAY OF STRINGS	To get a list of the names of the members of an object as an array of STRING.
`Delete()`	NO RESULT	Destroy the object - make it undefined
`EQ(any)`	BOOLEAN	Type-dependent comparison
`LT(any)`	BOOLEAN	Type-dependent comparison (converting first to STRING if all else fails)

Name	Result	Purpose
`Max(any)`	ANY	Return maximum of object and second object
`Min(any)`	ANY	Return minimum of object and second object
`NEQ(any)`	BOOLEAN	TRUE if objects do not have the same value(s)
`ObjectType()`	STRING	Return the type of the object as a string
`Set()`	BOOLEAN	TRUE if the object has been given a value(s)
`String()`	STRING	Convert the object to a STRING
`Unset()`	BOOLEAN	TRUE if the object does not have a value

Table 2: 2. Methods Available to All Objects

2.3 Forms and Menus Objects

2.3.1 Members Contained by All Gadgets

All gadgets contain the following members.

Name	Type	Purpose
`visible`	BOOLEAN Get/Set	You query this member to determine if a gadget is visible or invisible. To make a gadget visible, set it to TRUE; to make the gadget invisible, set it to FALSE.
`active`	BOOLEAN Get/Set	You query this member to determine if a gadget is active or inactive (greyed-out). To make a gadget active, set it to TRUE; to make the gadget inactive, set it to FALSE.

Name	Type	Purpose
`callback`	STRING Get/Set	Query or assign the gadget's callback string
`tag`	STRING Get/Set	Query or assign a gadget's tag text. This is not displayed for all gadgets.

Table 2: 3. Members Contained by All Gadgets

2.3.2 Summary of Gadget-Specific Methods

The table below summarises the methods that different gadgets support.

	Bar	Button	List	Option	Para	Slider	Text	Text-pane	Toggle /Rtoggle	View Alpha	View 2D	View 3D	Numeric Input	Container	Combobox	Frame	Line	Selector	View:Plot
`Add`	X			X											X				X
`Background`		X	X	X	X	X					X	X			X	X		X	X
`Clear`	X		X	X			X	X							X			X	X
`ClearSelection`			X	X											X			X	
`Container`	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
`CurPos`								X											
`DisplayText`				X											X				
`FieldProperty`	X																		
`FullName`	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
`Highlight`											X	X							X
`InsertAfter`	X																		
`InsertBefore`	X																		
`GetPickedPopup`		X	X	X	X	X		X	X	X	X	X	X	X	X			X	X
`Line`								X											
`Name`	X	X	X	X	X	X	X	X	X	X	X	X		X	X			X	
`Owner`	X	X	X	X	X	X	X	X	X	X	X	X		X	X			X	
`Refresh`	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
`RemovePopup`		X	X	X	X	X		X	X	X	X	X	X	X	X	X		X	X
`RestoreView`											X	X							
`RToggle`																X			
`SetEditable`							X	X											
`Select`			X	X											X			X	
`Selection`			X	X											X			X	
`SetActive`	X																		
`SetCurPos`								X											
`SetColumns`			X																

	Bar	Button	List	Option	Para	Slider	Text	Text-pane	Toggle /Rtoggle	View Alpha	View 2D	View 3D	Numeric Input	Container	Combobox	Frame	Line	Selector	View:Plot
`SetFieldProperty`	X																		
`SetFocus`		X	X	X		X	X	X	X	X			X		X			X	
`SetHeadings`			X																
`SetLine`								X											
`SetPopup`		X	X	X	X	X		X	X	X	X	X	X	X	X			X	X
`SetRange`													X						
`SetRows`			X																
`SetSize`										X	X	X							X
`SetTooltip`		X	X	X		X	X		X				X		X			X	
`SetValue`							X												
`ShowPopup`														X					
`Shown`	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
`Subtype`	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
`Type`	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
`ValidateCall`							X												

Table 2: 4. Summary of Gadget-Specific Methods

2.4 Gadget Syntax Graphs

2.4.1 Rules for Presenting and Using Syntax graphs

The rules for syntax graphs are as follows:

1. Each graph represents a command (or part of a command) to PDMS to perform specified actions with specified data. The graph is entered at "`graph_name>--`" or "`>--`", and exited at "**-->**". The allowed flow in a graph is top to bottom, and left to right, except where indicated otherwise by a "`*`" or "<" symbol.
2. Vertical lines with one or more "+" symbols represent a new state. These are always traversed downwards. There should be a "+" for each allowable entry point into a state. The "+" symbols can only be traversed from left to right.
3. Horizontals to the right of state lines, represent command words and data which are allowable in the state. They can only be traversed from left to right.
    1. Words starting with capitals represent command words. The capitalized part represents the minimum syntax which is recognized. Lower case parts denote optional characters. The whole thing is actually case independent as far as the user is concerned.
    2. Words enclosed in "< >" represent a call to the named graph. These should be lower case. Graph calls can be recursive.
    3. Words in lower case only, represent 'notionally' atomic data items, e.g. text, integer, val (numeric value). Sometimes they are in fact graph calls, e.g. '`fname`' and '`gname`'. Sometimes they are fictitious e.g. '`tagtext`', but more helpful than just "text" and easier to understand than a reference to, say, `<fgtag>`.

4. Continuous vertical and horizontal lines without a “ + “ symbol represent flow lines of the graph.
    1. The presence of a “*“ symbol in a vertical line indicates that the allowed direction of traverse is upwards.
    2. The presence of a “<“ symbol on a horizontal indicates that the allowed direction of traverse is backwards.
    3. The symbols “.“, “/“, “ ‘ “ are just cosmetic to help the graph to look better.

2.4.2 Setting Up Gadget Anchoring: <fganch>

The ANCHOR attribute allows you to control the position of an edge of the gadget relative to the corresponding edge of its container.

For example ANCHOR RIGHT specifies that the right hand edge of the gadget will maintain a fixed distance from the right hand edge of its owning container.

```
                                          .---<-------------.
                                         /                  |
>-- <fganch> -----------+-- ANCHOR --+--+- Left ----.       |
                                     |  +- Right ---|       |
                                     |  +- Top -----|       |
                                     |  ‘- Bottom --+---+---*
                                     |              |
                                     +---- None ----|
                                     ‘---- All------’-->
```

Figure 2:1. Syntax Graph -: Gadget Anchoring

2.4.3 Setting Up Gadget Docking: <fgdock>

The DOCK attribute allows you to dock a gadget to the left, right, top, or bottom edge of its container, typically a form or a frame; or you can cause the gadget to dock to all edges, or to no edges.

```
>-- <fgdock> -----------+-- DOCK ----+-----Left ----.
                                     +---- Right ---|
                                     +---- Top -----|
                                     +---- Bottom --|
                                     +---- None ----|
                                     ‘---- Fill ----’-->
```

Figure 2:2. Syntax Graph - Gadget Docking

Note: The DOCK and ANCHOR attributes are mutually exclusive.
Setting the DOCK attribute resets the ANCHOR to the default; setting the ANCHOR attribute resets DOCK to none.
You can set these attributes only when you define the gadget: you cannot change it after the exit from form setup. Thus you are not allowed to the resize behaviour at run-time.

2.4.4 Setting-Up the Gadget’s Position: <fgpos> and <fgprl>

You can use the AT syntax, shown below on the <fgpos> graph, to define the position of a gadget’s origin within a form.

You can specify the position absolutely (in form layout grid units) or relative to the extremities of existing gadgets, or relative to the size of the form and the gadget.

```
>-- <fgpos> -- AT --+- val val -------------------------------.
                    +- X val ------------.                    |
                    +- XMIN -.           |                    |
                    +- XCEN -|           |                    |
                    +- XMAX -+- <fgprl> -|                    |
                    ‘--------‘-----------+- Y val ------------|
                                         +- YMIN -.           |
                                         +- YCEN -|           |
                                         +- YMAX -‘- <fgprl> -|
                                         ‘--------------------‘-->
```

Figure 2:3. Syntax Graph - Absolute Positioning

The subgraph <fgprl>, shown below, sets the gadget position relative to another gadget or the form’s extent. For example, you can use it to position a gadget halfway across the width of a form.

```
>-- <fgprl> --+- <gname> -.
              +-- FORM ---|
              ‘-----------+- * val -----.
                          |             |
                          +- + val --.  |
                          +- - val --‘--+- + val * SIZE ---.
                          |             +- - val * SIZE ---|
                          |             +- + SIZE ---------|
                          |             +- - SIZE ---------|
                          |             ‘------------------|
                          +- + SIZE -----------------------|
                          +- - SIZE -----------------------|
                          ‘--------------------------------‘-->
```

Figure 2:4. Syntax Graph -: Relative Positioning

Examples of Using the AT Syntax

`AT 5 7.5`	Puts gadget origin at form grid coordinates (5, 7.5).
`AT X 5.5`	Puts gadget origin at form grid coordinates (5.5, y) where y is calculated automatically from the y extremity of the last placed gadget and the current VDISTANCE setting.
`AT YMAX+1`	Positions new gadget at (x, y) where x is calculated automatically from the x extremity of the last placed gadget and the current HDISTANCE setting. y is at YMAX+1 of the last gadget.

`AT XMIN.GAD1-2 YMAX.GAD2+1`	Positions new gadget with respect to two existing gadgets. Gadget is offset by 2 grid units to the left of GAD1(X=XMIN-2) and 1 unit below .GAD2 (Y=YMAX+1).
`AT XMAX FORM-SIZE YMAX FORM-SIZE`	XMAX FORM refers to the current right hand size of the form at its current stage of definition (not its final maximum extent). YMAX FORM refers to the form's current bottom extent. The -SIZE option subtracts the size of the gadget being positioned in the form. This example positions the gadget at the extreme right-hand bottom edge of the form.

2.4.5 Setting Up the Gadget's Width and Height: <vshap>

This operation allows you to set a gadget's width and height.

```
>-- <vshap> --+- <vwid> --+- <vhei> --------.
              |           +- ASPect (h/w) --|
              |           '-----------------'-->
              |
              '- <vhei> --+- <vwid> --------.
                          +- ASPect (h/w) --|
                          '-----------------'-->
```

Figure 2:5. Syntax Graph -: Gadget Geometry <vshap>

h/w is the value of the Aspect Ratio (height/width).

The units for <vshap> will have been preset to pixels or F&M grid units, appropriately.

The default width and height for <vshap> will have been preset, so leaving the graph with only width or height set still realises both values.

All values may be given as integer or reals.

Setting the Height: <vwid>

```
>-- <vwid> -- WIDth -+- val ------.
                     +- <gname> --|
                     '------------'-->
```

Setting the Width: <vhei>

```
>-- <vhei> -- HEIght -+- val ------.
                      +- <gname> --|
                      '------------'-->
```

2.4.6 Setting Up the Gadget’s Tagwidth (TEXT, TOGGLE and OPTION): <fgtagw>

The TAGWIDTH specifies the size of the gadget’s tag field in grid width units including any padding space, regardless of the actual tag string. Tagwidth is not needed for gadgets with an explicit area specification (width and height, lines or length). FRAME, LIST, SELECTOR, TEXTPANE and PARAGRAPH can always force an explicit width.

The syntax graph <fgtagw> defines the Tag specification

```
>-- <fgtagw> --+- TAGWIDth val -+-------------.
               ‘----------------‘-- tagtext --‘-->
```

Figure 2:6. Syntax Graph -: Gadget Tagwidth

The <fgtagw> graph supports both the simple ‘tagtext’ setting and/or the specification of the maximum width of any tag.

If the tag width is not explicitly given then it is assumed to be the number of characters in the ‘tagtext’ string multiplied by the horizontal grid size (the notional character width for the font).

You can specify the tag width without specifying any tagtext at definition time; this can be added at run time

2.4.7 Setting Up the Gadget’s 2D Screen Position: <xypos>

This shows how to set up a gadget’s 2D screen position in normalized co-ordinates.

```
     <xypos>--+- XR val -+- YR val -.
              ‘- YR val -+- XR val -‘-->
```

Figure 2:7. Syntax Graph - Gadget's 2d Screen Position

Note: Normalized co-ordinates represent a proportion of the full screen size.
`0.0 <= XR <= 1.0 and 0.0 <= YR <= 1.0.`

2.5 Object Type Details

This section contains details of the object types listed in *Table 2: 1.: Object Types and Classification*.

2.5.1 ALERT Object

Methods

Name	Result	Purpose
`Confirm( Message is STRING, X is REAL, Y is REAL )`	STRING 'YES' OR 'NO'	Show a blocking CONFIRM ALERT and retrieve the response. **X** and **Y** are optional screen positions.
`Error(Message is STRING, X is REAL, Y is REAL )`	STRING 'YES'	Show a blocking ERROR ALERT and retrieve the response. **X** and **Y** are optional screen positions.
`Message(Message is STRING, X is REAL, Y is REAL)`	STRING 'YES'	Show a blocking MESSAGE ALERT and retrieve the response and retrieve the response. **X** and **Y** are optional screen positions.
`Question(Message is STRING, X is REAL, Y is REAL )`	STRING 'YES', 'NO' OR 'CANCEL'	Show a blocking QUESTION ALERT and retrieve the response. **X** and **Y** are optional screen positions.
`Warning(Message is STRING, X is REAL, Y is REAL)`	STRING 'YES'	Show a blocking WARNING ALERT and retrieve the response and retrieve the response. **X** and **Y** are optional screen positions.
`!!Alert.Input( ! prompt is STRING, !default is STRING) is STRING`	STRING	Show a blocking INPUT ALERT. !**prompt** is the prompt displayed to the user, and !**default** is the default value in the text box.
`!!Alert.Input( !prompt is STRING, !default is STRING, xPos is REAL, yPos is REAL) is STRING`	STRING	Show a blocking INPUT ALERT. !**prompt** is the prompt displayed to the user, and !**default** is the default value in the text box. **xPos** and **yPos** are the coordinates of the top left-hand corner of the alert box.

Table 2: 5. Alert Object Methods

2.5.2 ARC Object

Basic ARC Definition: Members

Name	Type	Purpose
`Orientation`	ORIENTATION Get/Set	Orientation of the arc.
`Position`	POSITION Get/Set	Origin/Centre of the arc.
`Radius`	REAL Get/Set	Radius of the arc
`StartAngle`	REAL Get/Set	Angle from X axes to start of the arc.
`EndAngle`	REAL Get/Set	Angle from X axes to end of the arc.
`Sense`	BOOLEAN Get/Set	Arc sense: ·0 for clockwise ·1 for anti-clockwise

Table 2: 6. Basic ARC Definition Members

Basic ARC Definition: Methods

These methods do not modify the original object.

Name	Result	Purpose
`Arc( POSITION, ORIENTATION, REAL, REAL, REAL,BOOLEAN)`	ARC	Creates an arc with the given Position, Orientation, Start Angle, End Angle, Radius. If the last argument is TRUE, the arc is clockwise.
`String()`	STRING	Returns the arc as a string

Table 2: 7. Basic ARC Definition Methods

ARC Methods that Return ARCs

None of these methods modifies the original object.

Name	Result	Purpose
`StartPosition(POSITION)`	ARC	Returns a new arc, based on the original, where the start angle, if defined as the angle from the centre of the arc through the passed position mapped onto the arc plane, forms the X axis.
`EndPosition(POSITION)`	ARC	As `StartPosition`, but for the `EndAngle.`
`Through(POSITION)`	ARC	Returns a new arc, where the radius (of the full circle) passes through the passed position when mapped onto the arc plane.
`ChordHeight(REAL)`	ARC	Returns a new arc, based on the original, where the `EndAngle` is in such a position to produce the passed chord height. Chord height > Radius or Chord height < 0 return unset objects. New arc should not produce subtended angle > 180.
`Chord(REAL)`	ARC	Returns a new arc, maintaining the original `StartAngle`, so the `EndAngle` is at the specified distance from the Start Chord length > Radius * 2 or < 0 return an unset object.
`Circle()`	ARC	Returns a full circle definition of the arc.
`Circle(BOOLEAN)`	ARC	Returns a full circle definition of the arc. If True, the arc is anti-clock-wise
`Complement()`	ARC	Returns the complementary arc of the arc definition (the remainder of the circle)

Table 2: 8. ARC Methods that Return ARCs

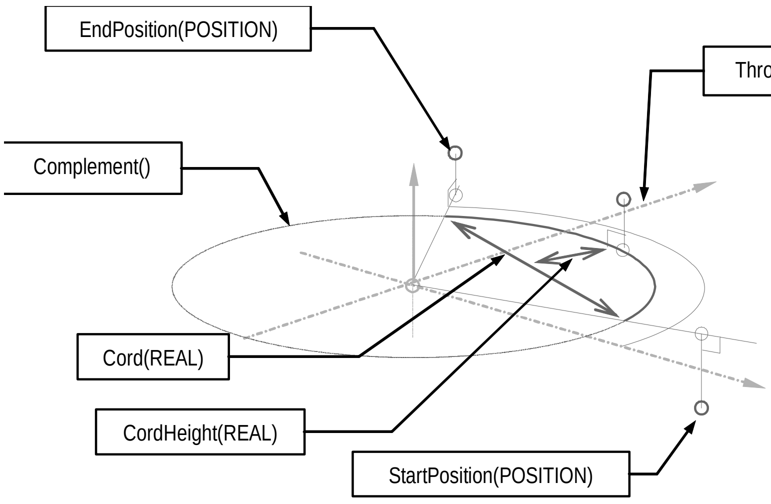


Figure 2:8. ARCs Returned by ARC Methods

ARC Method that Returns POSITIONs

This method does not modify the original object.

Name	Result	Purpose
`AnglePosition(REAL)`	POSITION	Returns the position at the specified angle on the arc.

Table 2: 9. ARC Methods that Return POSITIONs

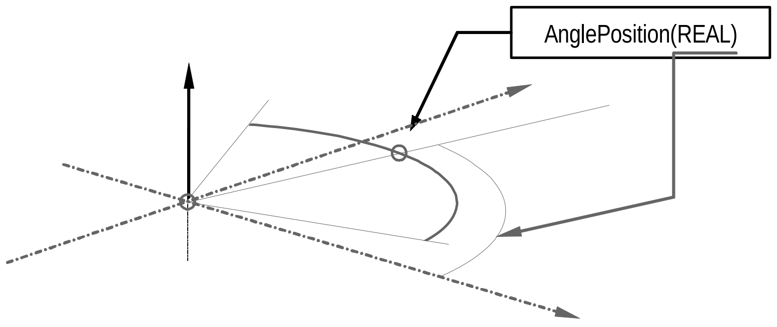


Figure 2:9. POSITIONs Returned by ARC Methods

ARC Methods that Return DIRECTIONs

None of these methods modifies the original object.

Name	Result	Purpose
`AngleDirection(REAL)`	DIRECTION	Returns the direction from the centre of the arc through a point at the given angle from the X axis
`StartTangent()`	DIRECTION	Returns the direction out of the arc, tangential to the start angle line. The "sense" of the arc is used.
`EndTangent()`	DIRECTION	Returns the direction out of the arc, tangential to the end angle line. The "sense" of the arc is used.
`AngleTangent(REAL)`	DIRECTION	Returns the direction, tangential to the angle passed.

Table 2: 10. ARC Methods that Return DIRECTIONs

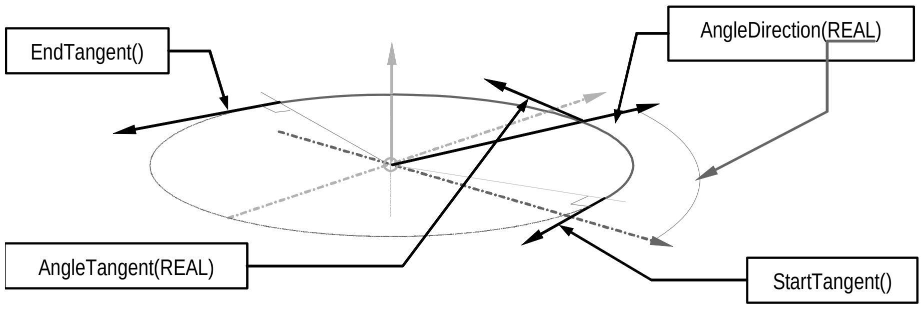


Figure 2:10. DIRECTIONs Returned by ARC Methods

ARC Methods that Return XYOffsets

This method does not modify the original object.

Name	Result	Purpose
`XYOffset(POSITION)`	XYPOSITI ON	Returns the position, mapped onto the arc plane, in term of an XY offset from the arc plane origin

Figure 2:11. ARC Methods that Return XYOffsets

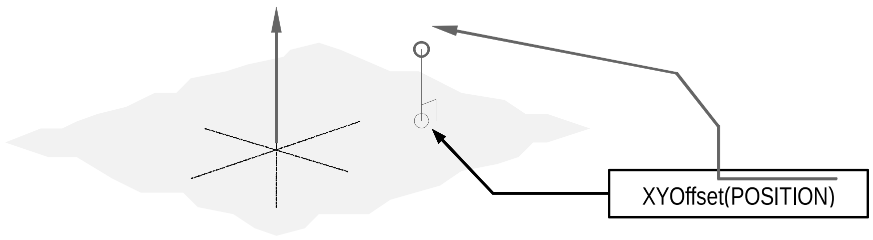


Figure 2:12. XYOffsets Returned from ARC Methods

ARC Methods that Return REALs

None of these methods modifies the original object.

Name	Result	Purpose
`Proportion(REAL)`	REAL	Returns the position, in terms of an angle from the X axis, at the proportion from the start angle of the arc: Angle = (EndAngle - StartAngle) * <real> + StartAngle
`Angle()`	REAL	Returns the subtended angle of the arc
`Near(POSITION)`	REAL	Returns the position, in terms of an angle from the X axis, to the position on the arc plane of the passed position

Table 2: 11. ARC Methods that Return REALs (a)

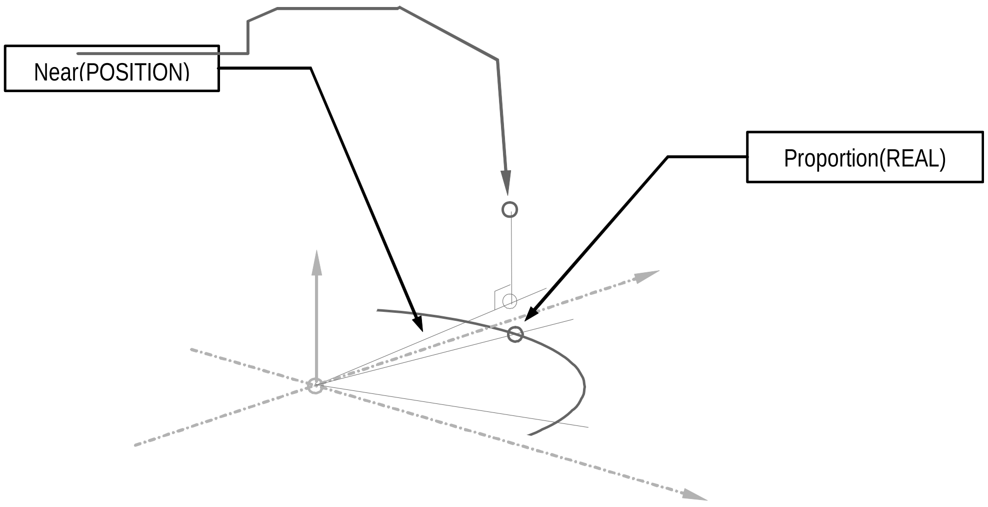


Figure 2:13. REALs Returned by ARC Methods (a)

Name	Result	Purpose
`Chord()`	REAL	Returns the chord length between the start and end of the arc definition
`Length()`	REAL	Returns the true length of the arc line
`ChordHeight()`	REAL	Returns the chord height of the arc line

Table 2: 12. ARC Methods that Return REALs (b)

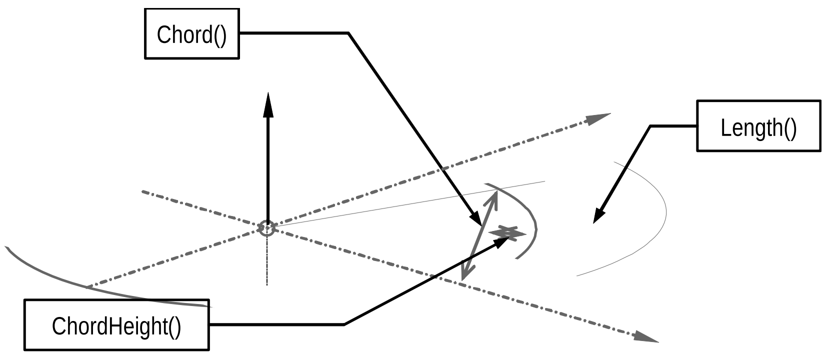


Figure 2:14. REALs Returned by ARC Methods (b)

ARC Intersection Methods that Return REAL ARRAYs

None of these methods modifies the original object.

Name	Result	Purpose
`Intersections(LINE)`	REAL ARRAY	Returns the intersection points, in terms of angles from the X axis, of the passed line (mapped onto arc plane) with the circle defined by the arc
`Intersections(PLANE)`	REAL ARRAY	Returns the intersection points, in terms of angles from the X axis, of the passed plane with the circle defined by the arc

Name	Result	Purpose
`Intersections(ARC)`	REAL ARRAY	Returns the intersection points, in terms of angles from the X axis, of the circle implied by the passed arc with the circle defined by the arc The Arcs **must** be in the same plane, i.e. the angle between Z components of the direction must be 0 or 180

Table 2: 13. ARC Intersection Methods that Return REAL ARRAYs

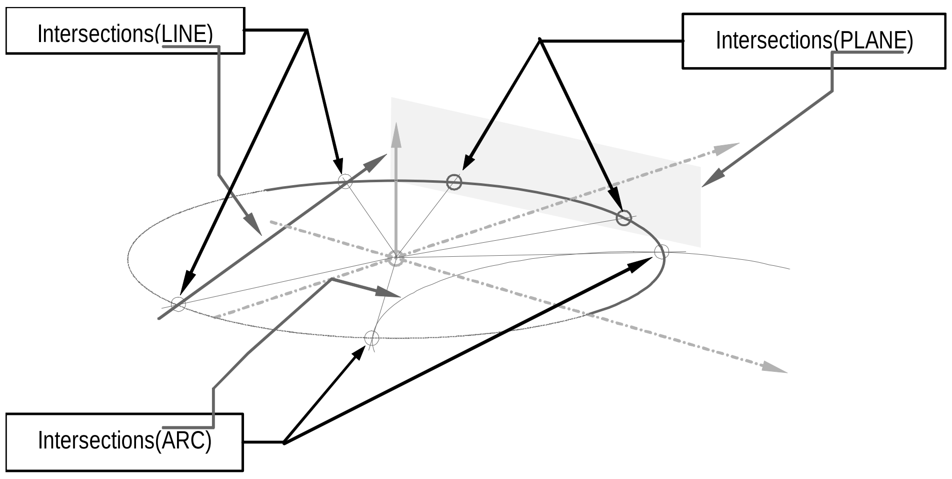


Figure 2:15. REAL ARRAYs Returned by ARC Intersection Methods

ARC Tangent Methods Returning Real Arrays

None of these methods modifies the original object.

Name	Result	Purpose
`Tangents(POSITION)`	REAL ARRAY	Returns the points of tangency on the arc circle from the passed position, in terms of angles from the X axis,
`Tangents(ARC)`	REAL ARRAY	Returns the points of tangency on the arc circle for the passed arc circle, in terms of angles from the X axis

Name	Result	Purpose
`Split()`	REAL ARRAY	Splits the arc into a non-zero number of segments
`Pole()`	POSITION	Returns the pole position of the arc

Table 2: 14. *ARC Tangent Methods that Return REAL ARRAYs*

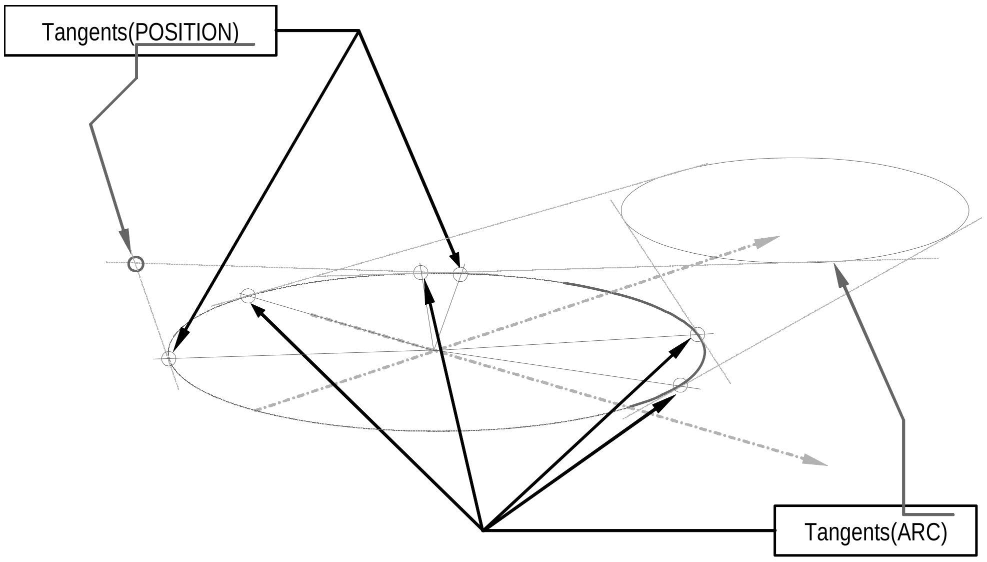


Figure 2:16. REAL ARRAYs Returned from ARC Tangent Methods

ARC Methods that Return BOOLEANs

None of these methods modify the original object.

Name	Result	Purpose
`On(POSITION)`	BOOLEAN	Returns true if the passed position lies on the arc line
`OnProjected(POSITION)`	BOOLEAN	Returns true if the passed position, when projected onto the arc line, lies within it
`OnExtended(POSITION)`	BOOLEAN	Returns true if the passed position, when mapped onto the arc line, lies outside it

Table 2: 15. ARC Methods that Return BOOLEANs

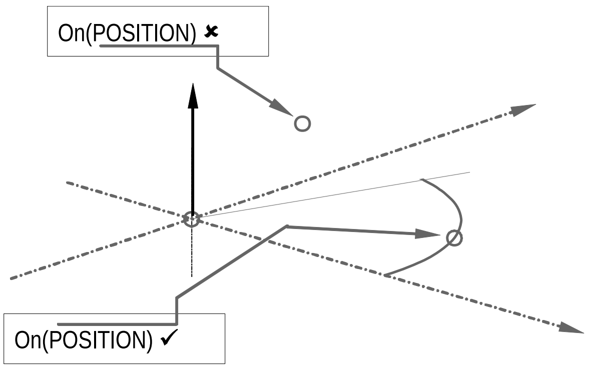


Figure 2:17. ARRAY Object PML Built-in Type

2.5.3 ARRAY Object

Methods

Name	Result	Purpose
`Append(ANY value)`	NO RESULT	Append **value** as a new element at the end of array.
`AppendArray(ARRAY values)`	NO RESULT	Append **array** values as new elements at the end of array.
`Clear()`	NO RESULT	Remove all elements.
`Compress()`	NO RESULT	Removed all undefined elements and re-index remaining elements.
`DeleteFrom( REAL index, REAL n)`	ARRAY	Make undefined **n** elements starting at **index**. Remaining elements are not re-indexed Returns an array of the deleted elements (which need not be assigned if not wanted).
`DeleteFrom( REAL index)`	ARRAY	Make undefined elements from **index** to end of array. Returns an array of the deleted elements. Remaining elements not re-indexed.

Name	Result	Purpose
`DeleteTo(REAL index, REAL n)`	ARRAY	Make undefined **n** elements up to **index** Returns an array of the deleted elements Remaining elements not re-indexed.
`DeleteTo(REAL index)`	ARRAY	Make undefined elements from start to **index** Returns an array of the deleted elements Remaining elements not re-indexed.
`Difference(ARRAY two)`	ARRAY	Return an array of those elements in the original array not present in array **two**. Duplicates will appear only once
`Empty()`	BOOLEAN	TRUE if array is empty
`Evaluate(BLOCK command)`	NEW ARRAY	Evaluate code in **command** at each element.
`Find(ANY value)`	NEW ARRAY	Search original array for **value** and return an array of index positions at which it was found.
`FindFirst(ANY value)`	REAL	Return index of first occurrence of **value**. Returns UNSET if not found.
`First()`	ANY	Return value of first defined element
`From(REAL index, REAL n)`	ARRAY	Copy sub array of **n** elements starting at **index.**
`From(REAL index)`	ARRAY	Copy sub array starting at **index** to end of array.
`GetIndexed(REAL index)`	ANY	Implements ARRAY[**index**] (this is an internal method).
`Indices()`	NEW ARRAY	Returns an array containing the indices of the target array that have a value.
`Insert(REAL index, ANY value)`	NO RESULT	Insert **value** as a new element at **index**. Later elements are re-indexed

Name	Result	Purpose
`InsertArray(REAL index, ARRAY ANY values)`	NO RESULT	Insert values as new elements with the first at **index.** Later elements are re-indexed
`Intersect(ARRAY two)`	NEW ARRAY	Return array of elements present in both arrays. Duplicates will appear only once.
`Invert()`	NEW ARRAY	Returns an inverted copy of the array.
`Last()`	ANY	Return last element value.
`MaxIndex()`	REAL	Subscript of last defined (non-empty) element.
`MinIndex()`	REAL	Subscript of first defined (non-empty) element.
`Overlay(REAL index, ARRAY two)`	NEW ARRAY	Replace array elements at **index** with elements from the array **two**. Returns an array of the elements which were overwritten (which need not be assigned if not required).
`ReIndex(REAL ARRAY indices)`	NO RESULT	Apply result of SORTEDINDICES to re-order array elements into positions specified by **indices.**
`Remove(REAL nth)`	ANY	Remove and Return **nth** element (which need not be assigned if not required). Remaining elements are re-indexed.
`RemoveFirst()`	ANY	Remove and Return first element (which need not be assigned if not required). Remaining elements are re-indexed.
`RemoveFrom(REAL index, REAL n)`	NEW ARRAY	Remove and Return new array of **n** elements starting with **index** (which need not be assigned if not required). Remaining elements are re-indexed.

Name	Result	Purpose
`RemoveFrom(REAL index)`	NEW ARRAY	Remove and Return new array of elements from **index** to end of array (which need not be assigned if not required). Remaining elements are re-indexed.
`RemoveLast()`	ANY	Remove and Return last element (which need not be assigned if not required). Remaining elements are re-indexed.
`RemoveTo(REAL index, REAL n)`	NEW ARRAY	Remove and Return **n** elements from start to **index** (which need not be assigned if not required). Remaining elements are re-indexed.
`RemoveTo(REAL index)`	NEW ARRAY	Remove and return elements from start to **index** (which need not be assigned if not required). Remaining elements are re-indexed.
`Size()`	REAL	Returns the number of defined elements.
`Sort()`	NO RESULT	Sort array into ascending order.
`SortUnique()`	NEW ARRAY	Returns a sorted copy of the array with duplicates removed.
`SortedIndices()`	NEW REAL ARRAY	Return new array of indices representing the sorted order of elements in array. The array itself is not sorted.
`To(REAL index, REAL n)`	ARRAY	Copy sub array of **n** elements from start to **index.**
`To(REAL index)`	ARRAY	Copy sub array from start of array to **index.**
`Union(ARRAY two)`	NEW ARRAY	Return array of elements present in either array (duplicates will appear only once).

Name	Result	Purpose
`Unique()`	NO RESULT	Discard duplicates and re-index remaining elements.
`Width()`	REAL	Return the maximum width of string elements (other element types are ignored).

Table 2: 16. ARRAY Object Methods

2.5.4 BANNER Object

Members

Name	Type	Purpose
`Company`	STRING	Company name, up to 120 characters.
`Copyright`	STRING	AVEVA copyright, up to 80 characters.
`Libraries`	ARRAY OF STRINGS	Library names
`Name`	STRING	Title for main windows, up to 13 characters
`Short`	STRING	Short form of company name
`Status`	STRING	PDMS release status

Table 2: 17. BANNER Object Members

Command

```
!BANNVAR = BANNER!    $ Returns a BANNER object
```

2.5.5 BAR Gadget

Methods

Name	Result	Purpose
`Add(STRING dText, STRING enu)`	NO RESULT	Appends a barmenu field, which can show the specified menu as a pulldown menu. The name of the pulldown menu is given in `menu`; the DTEXT of the field is given by `dText`.
`Clear()`	NO RESULT	Removes all barmenu fields. **Using this method is deprecated**.
`Clear(STRING  dText)`	NO RESULT	Removes all barmenu fields after and including the one with DTEXT `dText`. **Using this method is deprecated**.
`FieldProperty(STRING field, STRING property)`	BOOLEAN	Get the value of the property named in `property` for the menu field named in `field`. The allowed values for the property are 'ACTIVE' or 'VISIBLE'.
`FullName()`	STRING	Get the full name of the gadget, e.g.'!!Form.bar'.
`InsertAfter(STRING field, STRING dText, STRING menu)`	NO RESULT	Inserts a new barmenu field immediately after the one identified by `field`. The name of the menu is given in `menu`; the DTEXT of the new field is given by `dText`.
`InsertBefore(STRING field, STRING dText, STRING menu)`	NO RESULT	Inserts a new barmenu field immediately before the one identified by `field`. The name of the menu is given in `menu`; the DTEXT of the menu is given by `dText`.
`Name()`	STRING	Get the gadget's name, i.e. 'bar'
`Owner()`	FORM	Get the owning form.

Name	Result	Purpose
`SetActive( STRING dText, BOOLEAN state)`	NO RESULT	Deactivate/Activate the menu field whose DTEXT is `dText`. **Using this method is deprecated**.
`SetFieldProperty(STRING menu, STRING property, BOOLEAN state)`	NO RESULT	Set the value of the property named in `property` with the value of `state`, for the menu named in `menu`. The allowed values for the property are 'ACTIVE' or 'VISIBLE'.
`Shown()`	BOOLEAN	Get shown status.
`Type()`	STRING	Get the GADGET type as a STRING.

Table 2: 18. BAR Object Methods

Command

The BAR command creates a bar menu within a form definition.

The recommended way to create menu fields on the bar is to use the bar's `Add()` method.

```
bar
!this.bar.add ( 'Choose', 'Menu1')
!this.bar.add ( ' window', 'Window' )
!this.bar.add ( 'help', 'Help' )
```

Note: The use of the two special menu names ’Help’, which adds a system help menu that calls the online help; and ‘Window’, which adds a system Window menu that lists all the displayed windows.

2.5.6 BLOCK Object

This object holds expressions that are evaluated later.

Methods

Name	**Result**	**Purpose**
`Block( STRING expression)`	BLOCK	Creates a block expression.
`Evaluate()`	ANY	Evaluate block expression on object: check result is of TYPE type.
`Evaluate()`	ANY	Evaluate the expression and return the result
`Evaluate(STRING type)`	ANY	Evaluate expression and return an error if the result is not of TYPE **type**. Otherwise returns the result.

Table 2: 19. BLOCK Object Methods

2.5.7 BOOLEAN Object

Methods

None of these methods modifies the original object.

Name	**Result**	**Purpose**
`BOOLEAN(REAL value)`	BOOLEAN	Constructor that creates a boolean Object set to a non-zero value if boolean is TRUE; 0 if boolean is FALSE
`BOOLEAN(STRING value)`	BOOLEAN	Constructor that creates a boolean Object set to: 'TRUE' if boolean is T, TR, TRU, TRUE, Y, YE YES; ‘FALSE’ if boolean is F, FA, FAL, FALS, FALSE, N, NO.
`BOOLEAN( STRING value, FORMAT format)`	BOOLEAN	As above. FORMAT argument required for consistency by Forms and Menus.
`AND()`	BOOLEAN	TRUE if both values are TRUE
`NOT()`	BOOLEAN	TRUE if FALSE; FALSE if TRUE
`OR(BOOLEAN value)`	BOOLEAN	TRUE if either value is TRUE

Name	Result	Purpose
`Real()`	REAL	1 if boolean is TRUE; 0 if boolean is FALSE
`String()`	STRING	'TRUE' if boolean is TRUE. 'FALSE' if boolean is FALSE.

Table 2: 20. BOOLEAN Object Methods

2.5.8 BORE Object

Member

Name	Type	Purpose
`Size`	REAL Get/Set	The BORE size

Table 2: 21. BORE Object Members

Methods

None of these methods modifies the original object.

Name	Result	Purpose
`BORE(REAL value)`	BOOLEAN	Constructor that creates a BORE object with the given `value`.
`BORE(STRING value)`	BOOLEAN	Constructor that creates a BORE object with the given `value`.
`BORE(STRING value, FORMAT format)`	BOOLEAN	Constructor that creates a BORE object with the given `value`, and in the format specified by `format`.
`EQ(REAL value)`	BOOLEAN	Comparison with the argument `value` dependent on current BORE units.
`GEQ(BORE bore)`	BOOLEAN	TRUE if this object is greater than or equal to the argument `bore`.
`GEQ(REAL value)`	BOOLEAN	Comparison with the argument `value` dependent on current BORE units.
`GT(BORE bore)`	BOOLEAN	TRUE if BORE greater than BORE

Name	Result	Purpose
`GT(REAL value)`	BOOLEAN	Comparison with the argument `value` dependent on current BORE units
`LEQ(BORE bore)`	BOOLEAN	TRUE if this object is less than or equal to the argument `bore`.
`LEQ(REAL value)`	BOOLEAN	Comparison with the argument `value` dependent on current BORE units
`LT(BORE bore)`	BOOLEAN	TRUE if this object is less than `bore`.
`LT(REAL value)`	BOOLEAN	Comparison with the argument `value` dependent on current BORE units
`Real()`	REAL	Convert BORE to a REAL value
`String(FORMAT format)`	STRING	Convert BORE to a STRING using the settings in the global `format` object.

Figure 2:18. BORE Object Methods

2.5.9 BUTTON Gadget

Members

Name	Type	Purpose
`Background`	REAL Set/Get	Set or get Background Colour Number
`Background`	STRING Set Only	Set Background Colour Name
`Val`	BOOLEAN	TRUE when the button is pressed FALSE when it is not

Table 2: 22. BUTTON Object Members

Methods

Name	Result	Purpose

`AddPixmap(STRING file1, STRING file2, STRING file3 )`
`AddPixmap(STRING file1, STRING file2)`
`AddPixmap(STRING file )`
	NO RESULT	Adds pixmaps to be used for the unselected, selected and inactive states. The last two are optional.

`FullName()`	STRING	Get the full gadget name, e.g.'!!Form.gadget'.
`Name()`	STRING	Get the gadget's name, e.g. 'gadget'.
`Owner()`	FORM	Get owning form.
`SetPopup(MENU menu)`	NO RESULT	Links the given menu with the gadget as a popup.
`RemovePopup(MENU menu)`	NO RESULT	Removes the given popup menu from the gadget.
`GetPickedPopup()`	MENU	Returns the name of the menu picked from a popup.
`Shown()`	BOOLEAN	Get shown status.
`SetFocus()`	NO RESULT	Move keyboard focus to this gadget.
`Refresh()`	NO RESULT	Refresh display of gadget.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..
`SetToolTip(STRING)`	NO RESULT	Sets the text of the Tooltip.
`Type()`	STRING	Get the gadget-type as a STRING.

Table 2: 23. BUTTON Object Methods

Command

The BUTTON command defines a button, and specifies its position, tag or pixmap, callback text and control attribute.

You can define the BUTTON to be either PML-controlled, or core-code controlled using the gadget qualifier attribute *control type*, with values ‘PML” or “CORE”.

The files defining any pixmaps should be specified in the form's default constructor method using the gadget's `AddPixmap()` method.

A Button type Linklabel provides a purely textual button presentation, often used to indicate a link to some application item, e.g. a hyperlink to a file, a link to an associated form. An Example of the Linklabel gadget is shown on the example form in Fold up Gadget Link Example Form with Fold-up panels, NumericInput and Linklabel gadgets.

The tag text is shown in a different colour to all other gadget's tag text. The link label gadget highlights by underlining when the mouse cursor passes over it. Pressing it causes a SELECT event to be raised and runs any associated call back.

Note:

1. The Button has subtypes Normal, Toggle and Linklabel.
2. Linklabels are Buttons and so they do cause validation of any modified text fields of the form whenever they are pressed.
3. Linklabels:
    1. cannot have pixmaps assigned to them
    2. don't support change of background colour
    3. don't support 'pressed' and 'not pressed' value
    4. are not enclosed in a box
    5. can have popup menus (though this is not recommended)
    6. don't have Control Types e.g. OK, CANCEL etc
4. The sub-type of a Button gadget can be queried using the Button's Subtype method.

```
                                .--------<-------.
                               /                 |
>-BUTTON gname -+- LINKLabel -+-- tagtext -------|
                |             +-- <fgpos> -------|
                |             +-- CALLback text -|
                |             +-- TOOLTIP text --|
                |             +-- <fganch> ------|
                |             +-- <fgdock> ------|
                |             +-- CORE  ---------* Core managed gadget
                |             | .------<-----.
                |             |/             |
                |             +- FORM fname -|
                |             +- <vshap> ----*
                |             |
                |             +- TOOLTIP text -.
                |             '----------------'-->
                |
                |             .--------<----------.
                +-- TOGGLE -./                    |
                '-----------+- tagtext -----------|
                            +- <fgpos> -----------|
                            +- CALLback text -----|
                            +- TOOLTIP text ------|
                            +- <fganch> ----------|
                            +- <fgdock> ----------|
                            +- CORE --------------| Core managed gadget
                            +- BACKGround <colno>-|
                            +- PIXMAP <vshap> ----*
                            | .------<-----.
                            |/             |
                            +- FORM fname -|
                            +- <vshap> ----*
                            |
                            +- OK -----.
                            +- APPLY --|
                            +- CANCEL -|
                            +- RESET --|
                            +- HELP ---|
                            '----------+- TOOLTIP text -.
                                       '----------------'-->
```

Figure 2:19. Syntax Graph -: Creating a BUTTON Object

Note: It is bad practice to place one gadget on top of another. This may lead to gadgets being obscured.

Defaults: If no tag is specified, the tag defaults to the gadget's **gname**.

The control attribute is unset unless you specifically enter OK, APPLY, HELP, CANCEL or RESET. The default values for anchoring and docking are DOCK = none, and ANCHOR = Left + Top.

The Pixmaps associated with Button gadgets can be changed after the gadgets have been displayed on a form.

Method syntax is:

AddPixmap(!pixmap1 is STRING)
AddPixmap(!pixmap1 is STRING, !pixmap2 is STRING)

Where: !pixmap is a string holding the file pathname of the required .png file, e.g. %pmllib%\png\camera.png
!pixmap1 shows the Un-selected state of the gadget, and pixmap2 shows the Selected state.

Notes:

1. It is recommended that when you define the gadget you set its size to encompass the largest pixmap which you will later add. Failure to do this may give rise to unexpected behaviour.
2. Historically you could add a third pixmap which was used when the gadget was de-activated. This practice is no longer necessary as the gadget pixmapped is automatically greyed-out on de-activation.

2.5.10 COLLECTION Object

The collection object is used to extract database elements from the system using a selection filter (an expression object), restrictive search elements and scope lists.

Methods

Name	Result	Purpose
`Collection()`		Constructor (initialises all the object settings).
`Scope (COLLECTION)`		Empties the current scope list and makes the passed COLLECTION the current scope.
`Scope (DBREF)`		Empties the current scope list and makes the passed DBREF the current scope.
`AddScope`		Adds the passed DBREF to the current scope list.
`Scope (DBREF ARRAY)`		Replaces the current scope list with the passed list of DBREFs.
`AppendScope (DBREF ARRAY)`		Appends the passed list of DBREFs to the scope list.
`ClearScope()`		Empties the current scope list.
`Filter (EXPRESSION)`		Sets the filter to be applied to the collection.
`ClearFilter ()`		Empties the filter to be applied to the collection.
`Type (STRING)`		Empties the current scope type list and adds the passed element type.

Name	Result	Purpose
`AddType(STRING)`		Adds the passed element type to the scope type list.
`ClearTypes()`		Empties the types to be applied to the collection.
`Types (ARRAY elements)`		Replaces the scope element type list with the passed list, **elements**.
`AppendTypes (ARRAY types)`		Appends the passed list, **types**, to the scope type list.
`Initialise()`		Initialises an evaluate list, so all query actions re-evaluate the collection rules. Sets index position to 1.
`Filter()`	EXPRESSION	Returns the expression used to filter database elements.
`Scope()`	DBREF ARRAY	Returns the list of database elements to scan.
`Types()`	STRING ARRAY	Returns the list of database element types to be collected.
`Results()`	DBREF ARRAY	Returns the whole collection.
`Next(REAL n)`	DBREF ARRAY	Returns sub array from collection of **n** elements starting at current index position.
`Index()`	REAL	Returns the current index of the count being used by `Next()`.
`Size ()`	REAL	Returns the number of elements in the collection.

Table 2: 24. COLLECTION Object Methods

2.5.11 COLUMN Object

The column object defines the way in which a column of a table object is populated.

The formatting of a column should be separate from the column definition itself and be held within the report object used to extract data from a table object. This will allow the same table to have many different reports produced from it, without the need to regenerate the table.

Methods

Name	Result	Purpose
`Column()`		Constructor (initialises all the object settings)
`Column(EXPRESSION, BOOLEAN, BOOLEAN, STRING)`		Constructor setting Expression, Sort, Ascending, Key
`Key (STRING)`		Sets key and forces it to be uppercase
`Expression (EXPRESSION)`		Defines the expression used to populate the column
`Sort()`		Switches on column sort
`NoSort()`		Switches off column sort, this is the default setting
`Ascending()`		Sets column sort to ascending order
`Descending()`		Sets column sort to descending order
`Key()`	STRING	Returns the key word for use when reporting
`Expression()`	EXPRESSI ON	Returns the expression used to derive the content of the column
`IsSorted()`	BOOLEAN	Returns TRUE if the column is sorted
`SortType()`	STRING	Returns the column sort setting, ascending, descending or off

Table 2: 25. COLUMN Object Methods

2.5.12 COLUMNFORMAT

The column object defines the way in which a column of a table object is populated.

The formatting of a column should be separate from the column definition itself and be held within the report object used to extract data from a table object. This will allow the same table to have many different reports produced from it, without the need to regenerate the table.

Methods

Name	Result	Purpose
`ColumnFormat()`		Constructor (initialises all the object settings)
`Format(FORMAT)`		Sets the format of the column to the passed format
`Format(DATEFORMAT)`		Sets the format of the column to the passed date format
`FORMAT('STRING')`		Unsets the format of the column, i.e. the column
`Width (REAL)`		Sets the column width
`Widest()`		Sets the maximum column width flag, setting a specific width value automatically sets the flag to FALSE. Note that this is the least efficient method for Width because a complete scan has to be done to determine the widest.
`Indent(REAL, REAL)`		Sets left and right indents (i.e. spaces) in the column
`Format()`	FORMAT	Returns the format for numeric values in a column
`Width()`	REAL	Returns the column width, strings greater than the column width are wrapped on to the next line, numeric values greater than the column width are output as a column of hashes.
`GetWidest()`	BOOLEAN	Returns TRUE if “widest” is set
`Justification()`	STRING	Returns the column justification
`LeftIndent()`	REAL	Returns the left indent setting
`RightIndent()`	REAL	Returns the right indent setting

Table 2: 26. COLUMNFORMAT Object Methods

2.5.13 COMBOBOX Gadget

Members

Name	**Type**	**Purpose**
`Val`	REAL Get/ Set	Selected option number.
`DText`	ARRAY OF STRING Get/Set	Set or get the entire list of display texts.
`DText[n]`	STRING Get Only	Get the display text of the **n**'th option.
`RText`	ARRAY OF STRING Get/Set	Set or get the list of replacement texts.
`RText[n]`	STRING Get Only	Get the replacement text of the **n**'th option.
`Editable`	BOOLEAN Get/Set	Controls editable status of the text display field (ComboBox only)
`Scroll`	INTEGER Get/Set	Controls the maximum length of a text string which can be held and scrolled in the display text field (ComboBox only)
`Count`	REAL Get only	Get count of number of fields in the list.
`Val`	REAL Get/ Set	Selected field as integer. Zero implies no selection. Setting **val** to zero will cause an error if ZeroSel is not specified.

Table 2: 27. COMBOBOX Gadget Members

Methods

Name	**Result**	**Purpose**
`Add(STRING Dtext)`	NO RESULT	Append an entry to the drop down list, where **Dtext** is the text to display in the option list.
`Add(STRING Dtext, STRING Rtext))`	NO RESULT	Append and entry to the drop down list, where **Dtext** is the text to display in the option list, and **Rtext** is the replacement text for the new field. If **Rtext** isn't specified, it will be set to **Dtext** by default.
`Clear()`	NO RESULT	Clear gadget's contents.
`ClearSelection()`	NO RESULT	Clears selection and returns to default of first in list.
`FullName()`	STRING	Get the full gadget name, e.g.'!!Form.gadget'
`Name()`	STRING	Get the gadget's name, e.g. 'gadget'
`Owner()`	FORM	Get owning form.
`Select(STRING text, STRING value )`	NO RESULT	Select specified item in a list: **text** must be 'Rtext' or 'Dtext', and **value** is the item to be selected.
`Selection()`	STRING	Get current selection's RTEXT.
`Selection(STRING text )`	STRING	Get RTEXT or DTEXT of current selection; **text** must be 'Rtext' or 'Dtext'.
`SetPopup(MENU menu)`	NO RESULT	Links **menu** with the gadget as a popup.
`Refresh()`	NOT RESULT	Refreshes the display of the gadget.
`SetFocus()`	NO RESULT	Move keyboard focus to this gadget.
`RemovePopup(MENU menu)`	NO RESULT	Removes (popup) **menu** from the gadget.
`GetPickedPopup()`	MENU	Returns the last picked popup menu for the gadget.

Name	Result	Purpose
`Shown()`	BOOLEAN	Get ‘shown’ status.
`Type()`	STRING	Get the gadget type as a string.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..
`DisplayText( )`	STRING	Gets the text string currently displayed in the Option gadget's display field.
`SetPopup(  !menu )`	NO RESULT	Assigns a menu object as the gadget's current popup.
`Clear( !dtext )`	NO RESULT	Delete the field with the given DTEXT string.
`Clear( !fieldNumber )`	NO RESULT	Delete the specified field number.

Table 2: 28. COMBOBOX Gadget Methods

Command

```
                      .-------<-------.
                     /                |
>-- COMBObox gname -+- <fgtagw> ------|
                    +- <fgpos> -------|
                    +- <fganch> ------|
                    +- <fgdock> ------|
                    +- CALLback text -|
                    +- TOOLTIP text --|
                    +- NORESELect ----|
                    +- ZEROSELection -|
                    +- CORE ----------* Core managed gadget
                    | .-------<-------.
                    |/                |
                    +- SCRoll int ----|
                    +- <vwid> --------*
                    |
                    +- TOOLTIP text -.
                    '----------------'-->
```

When the ComboBox is editable, with the drop-down list closed, the user can search for a required option by typing the first few letters into the display field and clicking the down-arrow. The list will open with the first matching option highlighted. This is useful for large lists.

Behaviour

The COMBOBOX command is a combination of an option list and an editable text display field similar to a windows combobox. It shares most of the properties and methods of the Option gadget.

Combo gadget has editable display text field (default) and so supports scroll width. Combobox does not support display of pixmaps.

Note: It is bad practice to place one gadget on top of another. This may lead to gadgets being obscured.

Unselected Events

Option gadgets support UNSELECT events. Typically when a field in the dropdown list is selected, an UNSELECT event is raised for the previously selected field (if any) and then a SELECT event is raised for the new field.

Notes:

1. UNSELECT events are not notified to PML unless an open callback has been specified (so that SELECT and UNSELECT events can be differentiated).
2. Typically the UNSELECT action allows Appware to manage consequences of deselection for any dependent gadgets or forms.
3. We recommend that you do not change the option gadget's selection programmatically in an UNSELECT event.

Text Entry and Editing

When the editable property is set (default), the display field is accessible to the user, who can edit the contents by typing at the keyboard or pasting text into the field. If the user presses the ENTER key while the gadget's text field has focus and contains some characters, a VALIDATE event is raised. You can trap this event by assigning a PML Open callback to the gadget. This callback allows you to give meaning to the action of typing text into the display field.

The Open callback is necessary to differentiate the VALIDATE event from the SELECT and UNSELECT events.

On receipt of the VALIDATE event, your callback method can retrieve the displayed text by means of the **DisplayText** method and decide what action is associated.

Additionally you can assign a popup menu to the gadget, which gives the user the choice of several actions.

2.5.14 CONTAINER Gadget

Members

Member Name	Type	Purpose
type	STRING Get/Set	Gadget type as string 'Container'.
control	REAL Get/Set	Integer handle of external control.
popup	MENU Get/Set	Popup menu associated with the control.

Methods

Method Name	Result	Purpose
ShowPopup(!x is REAL, !y is REAL)	NO RESULT	Show the associated popup at the specified position. Position is the integer pixel position within the enclosed control.
FullName( )	STRING	Get the full gadget name, i.e. !!Form.gadget.
Name( )	STRING	Get the gadget's name
Owner( )	FORM	Get owning form
GetPickedPopup( )	MENU	Returns the last picked popup menu for the gadget.
Shown( )	BOOLEAN	Get 'shown' status.

Command

The Container gadget allows the hosting of an external Control, e.g. a PMLNet, control inside a PML defined form. It allows the user to add an external .Net control, which may raise events that can be handled by PML. In order to customise the context menus of the .Net control, the Container may have a PML popup menu assigned to it. This is shown when the .Net control raises a 'popup' event.

```
                         .--<-----.
                        /          |
>---- CONTAINER gname -+- NOBOX ---|
                       +- INDENT --*
                       |
                       '- PMLNET/CONTROL -+- handle -.
                                          '----------|
                       .----<-----------------------*
                       |
                       | .----<-----------------.
                       |/                       |
                       +-- tagtext -------------|
                       +-- <fgpos> -------------|
                       +-- <fganch> ------------|
                       +-- <fgdock> ------------*
                       |
                       +-- <vshape> -.
                       '-------------'-->
```

Notes:

1. By default the Container will be enclosed in a box, but you can select NOBOX or INDENT.
2. Only PMLNet controls are supported.
3. 'handle' is the integer token identifying the control.
4. Positioning must be specified before size (<vshape>).
5. Dock and Anchor are supported to allow intelligent resize behaviour. The enclosed control must support resizing and is usually set as Dock fill, so that it follows size changes of the Container.

2.5.15 DATEFORMAT Object

The DATEFORMAT object is used to allow date attributes to be sorted in date order.

Examples:

```
!format = object DATEFORMAT(T D/M/Y')
!format.month('INTEGER')
!format.year(2)                                $ 12:10 05/01/01
!format = object DATEFORMAT('T D M Y')
!format .month('BRIEF')                        $ 12:10 05 Nov 01
!format = object DATEFORMAT ('D M')
!format.year(4)
!format.month('FULL)                           $ 5 November 2001
```

Methods

Name	Result	Purpose
`DateFormat(STRING format)`		Constructor. Defines a format. The input string, **format**, is in the form 'T*D*M*Y', where T = time, D = day, M = month, Y = year, and the order of the letters indicate the format required. T and D are optional. H could be used if only hours are required. * is the separator character.
`DateFormat()`		Sets default format ('T M D Y', month = 'INTEGER', year = 2)
`Month(STRING)`		Sets month format. 'INTEGER', 'BRIEF' or 'FULL'
`Year(INT)`		Sets year format. 2 or 4 for number of digits
`String(DATETIME)`	STRING	Input a date in DATETIME format and convert to the specified format.
`String(STRING)`	STRING	Input a date in PDMS format and convert to the specified format.

Table 2: 29. DATEFORMAT Object Methods

2.5.16 DATETIME Object

Methods

Name	Result	Purpose
`DateTime()`	DATETIME	Create a DATETIME object with current date and time in it.
`DateTime(REAL year, REAL month, REAL date)`	DATETIME	Create a DATETIME set to the given year, month, date. Time defaults to 00:00:00.
`DateTime(REAL year, STRING month. REAL date)`	DATETIME	As above, but month is a STRING at least three characters long representing month e.g. 'Jan', 'March', 'DECEM'
`DateTime(REAL year, REAL month, REAL date, REAL hour,REAL minute)`	DATETIME	Create a DATETIME object set to given year, month, date, hour, minute. Seconds default to 0.
`DateTime(REAL year, STRING month, REAL date, REAL hour, REAL minute)`	DATETIME	As above, but month is a STRING at least three characters long representing month e.g. 'Jan', 'March', 'DECEM'
`DateTime(REAL year, REAL month, REAL date, REAL hour, REAL minute, REAL second)`	DATETIME	Create a DATETIME object set to given year, month, date, hour, minute, second.
`DateTime(REAL year, STRING month, REAL date, REAL hour, REAL minute, REAL second)`	DATETIME	As above, but month is a STRING at least three characters long representing month e.g. 'Jan', 'March', 'DECEM'
`Date()`	REAL	Return day of month for this DATETIME object (1-31).
`GEQ(DATETIME)`	BOOLEAN	Test whether this DATETIME is later than or the same as argument DATETIME.
`GT(DATETIME)`	BOOLEAN	Test whether this date is later than argument DATETIME.
`HOUR()`	REAL	Return hour as REAL for this DATETIME object (0-23).

Name	Result	Purpose
`LEQ(DATETIME)`	BOOLEAN	Test whether this DATETIME is earlier or the same as argument DATETIME
`LT(DATETIME)`	BOOLEAN	Test whether this DATETIME is earlier than argument DATETIME.
`Minute()`	REAL	Return minutes as REAL for this DATETIME object (0-59).
`Month()`	REAL	Return month as REAL for this DATETIME object (1-12).
`MonthString()`	STRING	Return month as STRING for this DATETIME object ('January', 'February', etc.)
`Second()`	REAL	Return number of seconds as REAL for this DATETIME object (0-59).
`Year()`	REAL	Return year as REAL (e.g. 1998)

Table 2: 30. DATETIME Object Methods

2.5.17 DB Object

Members

Name	**Type**	**Purpose**
`Name`	STRING	The name of the database, up to 32 characters.
`Description`	STRING	The database description, up to 120 characters.
`Access`	STRING	Access type (UPDATE, MULTIWRITE, CONTROLLED).
`Claim`	STRING	Claim mode for multi-write databases (EXPLICIT, IMPLICIT).
`File`	STRING	Database filename, up to 17 characters.
`Foreign`	STRING	FOREIGN or LOCAL
`Number`	STRING	Database number
`Team`	TEAM	Owning Team
`Type`	STRING	Database type, e.g. DESI
`Refno`	STRING	String containing Database reference number
`Primary`	STRING	Identifies whether a database is PRIMARY or SECONDARY at the current location in a global project

Table 2: 31. DB Object Members

Methods

Name	Result	Purpose
`MDBList()`	ARRAY	List of MDBS which contain this DB.
`Size()`	REAL	File size in pages.
`Sessions()`	ARRAY OF DBSESS	All sessions of the current database.
`Lastsession()`	DBSESS	Last session information for database.
`DB(DBREF)`	DB	Returns a DB object, given a DBREF.
`DB(STRING)`	DB	Returns a DB object, given a name or reference number.

Table 2: 32. DB Object Methods

These methods may be used in the following ways (in all cases **!!CE** is assumed to be a DB DATABASE element and **!!CE.Name** is a STRING object containing the element's name).

Examples:

```
!D = OBJECT DB(!!CE)
!D = OBJECT DB(!!CE.Name)
!D = !!CE.DB()
!D = !!CE.Name.DB()
```

These methods should assist performance improvements to appware by making it easier to get from Database element to Object.

Command

```
!ARRAY = DBS
```
$ Returns an array of the DBs in the current project

2.5.18 DBREF Object

Methods

Name	**Result**	**Purpose**
`Dbref( STRING )`	DBREF	Creates a DBREF object with value set to the given STRING.
`Dbref( STRING, FORMAT )`	DBREF	As above. FORMAT argument required for consistency by Forms and Menus.
`Attribute(STRING Name)`	ANY	Return the value of the named Attribute
`Attributes()`	ARRAY OF STRING	A DBREF appears to have the attributes of whatever DB elements it is pointing to
`BadRef()`	BOOLEAN	TRUE if DBREF is not valid (cannot navigate to it)
`Delete()`	NO RESULT	Deletes the PML DBREF (not the database element it is pointing to)
`MCount()`	REAL	Count of number of members of element referenced
`MCount(STRING type)`	REAL	Count of number of members of element referenced of type specified
`String(FORMAT)`	STRING	Convert to STRING using settings in global FORMAT object
`Line([CUT/UNCUT])`	LINE	Returns the cut/uncut pline of a SCTN/GENSEC element as a bounded line
`PPosition(REAL)`	POSITION	Returns the position of the specified Ppoint of a database element.
`PDirection(REAL)`	DIRECTION	Returns the direction of the specified Ppoint of a database element.

Table 2: 33. DB Object Methods

2.5.19 DBSESS Object

Members

Name	Result	Purpose
`Number`	REAL	Session number
`Date`	STRING	Date when session started
`Author`	STRING	Creator of session
`Comment`	STRING	Session comment

Table 2: 34. DBSESS Object Members

2.5.20 DIRECTION Object

Members

Name	Type	Purpose
`East`	REAL Get/Set	UP component
`North`	REAL Get/Set	NORTH component
`Up`	REAL Get/Set	UP component
`Origin`	DBREF Get/Set	DB element that is the origin

Table 2: 35. DIRECTION Object Members

Methods

None of these methods modifies the original object.

Name	Result	Purpose
`Direction( STRING )`	DIRECTION	Creates a DIRECTION with the value given by STRING.
`Direction( STRING, FORMAT )`	DIRECTION	Creates a DIRECTION with the value given by STRING, in the format specified.
`EQ(DIRECTION)`	BOOLEAN	TRUE if two directions are the same

Name	Result	Purpose
`LT(DIRECTION)`	BOOLEAN	TRUE if direction is less than argument.
`String(FORMAT)`	STRING	Convert to STRING.
`WRT(DBREF)`	DIRECTION	Convert to a new DIRECTION with respect to a given element.
`Angle(DIRECTION)`	REAL	Returns the angle between the two directions.
`Bisect(DIRECTION)`	DIRECTION	Returns the direction which is half way between the two directions.
`Cross(DIRECTION)`	DIRECTION	Returns the cross product of the two directions.
`Dot(DIRECTION)`	REAL	Returns the dot product of the two directions.
`IsParallel(DIRECTION)`	BOOLEAN	Returns true if the supplied directions are parallel, false otherwise.
`IsParallel(DIRECTION, REAL)`	BOOLEAN	Returns true if the supplied directions are parallel according to tolerance supplied, false otherwise.
`Opposite()`	DIRECTION	Returns the opposite direction.
`Orthogonal(DIRECTION)`	DIRECTION	Returns the direction orthogonal between the two directions.
`Projected(PLANE)`	DIRECTION	Returns a direction projected onto the passed plane.
`IsPerpendicular(DIRECTION)`	BOOLEAN	Returns true if the supplied directions are perpendicular, false otherwise.
`IsPerpendicular(DIRECTION, REAL)`	BOOLEAN	Returns true if the supplied directions are perpendicular according to tolerance supplied, false otherwise.

Table 2: 36. DIRECTION Object Methods

2.5.21 EXPRESSION Object

This object is used to define a basic expression that can be applied against a database element or another object and return any data typed result, BOOLEAN, STRING, etc.

EXPRESSION objects may be used by COLLECTION objects to filter the results of the collection.

Methods

Name	Result	Purpose
`Expression`		Constructor (initialises all the object's settings).
`Expression (STRING)`		Constructs and defines the expression. ('ATTRIBUTE----') should be used for attributes for speed and efficiency. Other examples are ('PURP eq IPIPINGI') or ('XLEN + STRING(XLEN)').
`AttributeExpression (STRING)`		Makes the passed attribute an expression. AttributeExpression ('LENGTH') is the same as Expression ('ATTRIBUTE LENGTH').
`String()`	STRING	Returns the current expression as a string.
`Evaluate(DBREF)`	ANY	Evaluates the current expression against the passed object

Table 2: 37. EXPRESSION Object Methods

2.5.22 FILE Object

Methods

Name	Result	Purpose
`File(STRING)`	FILE	Create a FILE object on a file whose name is given in STRING.
`AccessMode()`	STRING	Return access mode for the file {'CLOSED', 'READ', 'WRITE', 'OVERWRITE', 'APPEND}.
`Close()`	NO RESULT	Close file if open.
`Copy(STRING)`	FILE	Copies the file whose pathname is given in STRING. Returns FILE object for copied file.
`Copy(FILE)`	FILE	Copies the file represented by the FILE object. Returns FILE object for copied file.
`DeleteFile()`	NO RESULT	Delete the file represented by the file object if it exists.
`Directory()`	FILE	Returns a FILE object corresponding to owning directory.
`DTM()`	DATETIME	Returns a DATETIME object holding the date and time that this file was last modified.
`Entry()`	STRING	Returns file name as string.
`Exists()`	BOOLEAN	Returns BOOLEAN indicating whether file exists or not.
`Files()`	ARRAY OF FILES	Returns an ARRAY of FILE objects corresponding to files owned by this directory.
`FullName()`	STRING	Returns the name including path for this FILE object as a STRING.
`IsOpen()`	BOOLEAN	Return BOOLEAN indicating whether file is open or not.

Name	Result	Purpose
`LineNumber()`	REAL	Return line number of line about to be written.
`Move(STRING)`	FILE	Move this file to location given in STRING. Return FILE object for moved file.
`Move(FILE)`	FILE	Move this file to location represented by FILE object.
`Name()`	STRING	Return name of this FILE object as STRING.
`Open(STRING)`	NO RESULT	Opens this file in the mode given by STRING {'READ','WRITE','OVERWRITE', 'APPEND'}
`Owner()`	STRING	Returns the ID of this FILES owner a STRING.
`Path()`	ARRAY OF FILES	Returns an ARRAY of FILEs corresponding to the owning directories of this FILE object.
`PathName()`	STRING	Returns owning path as a STRING.
`ReadFile()`	ARRAY OF STRING	Open, read contents and close file. Data returned as an ARRAY of STRINGs corresponding to the lines in the file.
`ReadFile(REAL)`	ARRAY OF STRING	As above, but ensures that file is no longer than number of lines given in REAL.
`ReadRecord()`	STRING	Reads a line from an open file and returns it in a STRING. Returns an UNSET STRING if end of file is detected.
`Set()`	BOOLEAN	Returns a BOOLEAN indicating whether this FILE object has a name set or not.
`Size()`	REAL	Returns size of file in bytes.
`SubDirs()`	ARRAY OF FILE	Returns an ARRAY of FILE objects corresponding to directories owned by this directory.

Name	Result	Purpose
`Type()`	STRING	Returns a STRING indicating whether this object represents a ‘FILE’ or a ‘DIRECTORY’.
`WriteFile(STRING, ARRAY OF STRING)`	NO RESULT	Opens file in mode given in string {‘WRITE’, ’OVERWRITE’, ’APPEND’}, writes STRINGs in ARRAY and closes file.
`WriteRecord(STRING)`	NO RESULT	Writes STRING to this FILE which must already be open.

Table 2: 38. FILE Object Methods

2.5.23 FMSYS Object

Methods

None of these methods modifies the original object.

Name	Result	Purpose
`SetMain(FORM)`	FORM	Sets the main form for an Application.
`Main()`	FORM	Query the current main form
`Refresh()`	NO RESULT	Refresh all VIEW gadgets
`Checkrefs`	BOOLEAN	By default, all references in a Form definition are checked when a form is displayed. Checking can be switched off, which may be recommended if performance problems are experienced.
`SetInterrupt(GADGET)`	NO RESULT	Sets the Gadget which will interrupt macro or function processing.
`Splashscreen(BOOLEAN)`	NO RESULT	Removes the display of a splash screen after an abnormal exit.
`Interrupt()`	BOOLEAN	Set to TRUE if the interrupt gadget has been selected.
`FMINFO()`	ARRAY OF STRINGS	Returns array of all FMINFO strings.

Name	Result	Purpose
`DocsAtMaxScreen(BOOLEAN)`	NO RESULT	Sets default placement position for document forms to be towards the maximum (rightmost) of the screen. Useful for wide screen ad twin screen devices.
`Progress( )`	REAL	Get the current Integer value in percent shown by the progress bar, in the range 0 to 100. Zero means the bars is invisible
`SetProgress( !percent)`	NO RESULT	Set the Integer value in percent to be displayed in the progress bar. Values will be forced into the range 0 to 100. Resultant value of 0 will cause the bar to become invisible.
`CurrentDocument()`	FORM	This method returns the current Document of the application framework as a FORM object. If there is no current document then the returned form has value **Unset**.
`LoadForm(STRING formname)`	FORM	Allows force loading of a form definition and/or the ability to get a reference to a form object by name. If the form exists then a reference to the form object is returned. If it doesn't exist, then an attempt is made to force load its definition. If this fails then an unset form reference is returned.
`SetHelpFileAlias (alias is string)`	NONE	establishes the application help file from its alias.
`HelpFileAlias()`	STRING	returns the current help file's alias.
`OKCurfnView(!viewtype is STRING)`	BOOLEAN	Queries whether graphical views of the specified view type are displayed. Graphical view types supported are: 'G2D'; 'G3D'; 'ANY' and any view subtype is implied.

Name	Result	Purpose
`OKCurfnView(!viewtype is STRING, subtype is STRING )`	BOOLEAN	Queries whether graphical views of the specified view type and subtype are displayed. Graphical view types supported are: 'G2D'; 'G3D'; 'ANY'. View subtypes supported are: 'ANY' and for G2D: 'NORMAL' (Draft); 'PLOT'; 'ISOSPOOL' G3D: 'NORMAL' (Design)
`SetDefaultFormat(!!fmt is FORMAT)`	NO RESULT	Provide a default global format object to be used if no specific format is defined for any typed text field. Once only call, users cannot change it. !!fmt must be a global variable.
`DefaultFormat()`	FORMAT	Query the system default format object for use by typed text gadgets. If none defined then returns an Unset local variable. The returned format object is a copy, so changing it will not affect the system default format. However the user can apply it to variables e.g !text=!myVar.String(!!fmsys.defaultFormat())

Table 2: 39. FMSYS Object Methods

2.5.24 FORM Object

Members

Name	Type	Purpose
`FormRevision`	STRING Get/ Set	Form Revision text.
`FormTitle`	STRING Get/ Set	Form title.
`IconTitle`	STRING Get/ Set	Icon title.
`Initcall`	STRING Get/ Set	Callback executed when form is initialised.

Name	Type	Purpose
`Autocall`	STRING Get/Set	Callback executed when any of the specified application attributes have changed.
`Okcall`	STRING Get/Set	Callback executed when OK button is pressed.
`Cancelcall`	STRING Get/Set	Callback executed when CANCEL button is pressed.
`KeyboardFocus`	GADGET Get/Set	Gadget to have initial keyboard focus on display of the form. One of TEXTFIELD, TEXTPANE, BUTTON, TOGGLE or ALPHA VIEW.
`AutoScroll`	BOOLEAN Get/Set	If AutoScroll is selected the form will automatically gain horizontal or vertical scrollbars if the forms size becomes too small to display its defined contents. This member does not apply to form types Main Window and Document.
`Quitcall`	STRING Get/Set	Callback executed whenever the user presses the Quit/Close icon (X) on the title bar of forms and the main application window. For forms of type MAIN, the `QUITCALL` callback is executed, if present. This permits the user to terminate the application, and so the associated PML callback should prompt the user for confirmation. For all other form types, the `QUITCALL` callback is executed, if present, and then the form and its children are hidden unless the PML callback returns an error. When the form nest is hidden the `CANCELCALL` callback for each form of the nest is executed (in reverse display order).
`Maximised`	BOOLEAN Get/Set	Get/set form's maximised status (on screen).

Name	Type	Purpose
`Active`	BOOLEAN Get Only	Gives form's active/inactive status.
`Popup`	MENU Get/Set	Get/set form's current popup menu.
`HelpContextID`	STRING	Read/Write STRING Property:!!myform.HelpContextID = STRING - sets the context Id within the help file for this form. STRING=!!myform.HelpContextID - gets the current context Id for this form.
`Killingcall`	STRING Get/Set	Notify the form that it is being destroyed and allow the assigned callback method to destroy any associated resources, e.g. global PML objects which would otherwise not be destroyed (see Killing callback).
`FirstShowncall`	STRING Get/Set	Allow the user to carry out any form actions which can only be completed when the form is actually displayed for the first time (see FirstShown callback).

Table 2: 40. FORM Object Members

Methods

Name	Result	Purpose
`Name()`	STRING	Get name.
`FullName()`	STRING	Get the full form name (Including !!).
`NewMenu(STRING menuname)`	MENU	Adds a new named menu to the form.
`NewMenu(STRING menuname, STRING type)`	MENU	Adds a new named and typed menu to the form. The first argument is the name of the new menu; the second argument is the type of the menu, and must be either 'POPUP' or 'MAIN'.

Name	Result	Purpose
`SetActive(BOOLEAN)`	NO RESULT	`SetActive(FALSE)` greys-out all gadgets on the form, but doesn't set their Active status, so that `SetActive(TRUE)` restores the form to the precise state it was in before greying out, i.e. any inactive gadgets will still be inactive.
`SetGadgetsActive(BOOLEAN)`	NO RESULT	`SetGadgetsActive(FALSE)` greys out all gadgets on the form and sets their Active status to 'inactive', i.e. their previous active state is lost. Similarly `SetGadgetsActive(TRUE)` greys-in all gadgets and sets their Active status to 'active'.
`SetPopup(MENU)`	NO RESULT	Specifies the pop-up to be displayed when the right-hand mouse button is released over the form background.
`RemovePopup(MENU)`	NO RESULT	Removes a pop-up associated with a form.
`GetPickedPopup()`	MENU	Returns the last picked popup menu for the form.
`Show('FREE')`	NO RESULT	Show the form on the screen as a FREE form.
`Show('AT', REAL X, REAL Y)`	NO RESULT	Show the form as a FREE form with the origin at the X,Y relative screen position.
`Show('CEN', REAL X, REAL Y)`	NO RESULT	Show the form as a FREE form with its centre at the X,Y relative screen position.
`Shown()`	BOOLEAN	Get 'shown' status
`Hide()`	NO RESULT	Hides the form (removes it from the screen)
`Owner()`	FORM	Returns the form's parent form, or unset variable if the form is free-standing

Name	Result	Purpose
`SetOpacity( REAL PERCENT )`	NONE	Set the percentage opaqueness of the form as an integer in the range 10 (nearly transparent) to 100 (opaque - default). This is only valid for non-docking Dialog and BlockingDialog form types.
`Subtype( )`	STRING	Gets the form's subtype, one of 'DIALOG', 'BLOCKINGDIALOG', 'MAIN', 'DOCUMENT'
`SetUndoable ( )`	STRING, ANY	
`Undoable ( )`	STRING	

Table 2: 41. FORM Object Methods

Note: `SetActive()`and `SetGadgetsActive()`can be used in combination with each other and with the **Active** property of individual gadgets.

Commands

SETUP FORM

A form definition is introduced by the SETUP FORM command and terminated by a corresponding EXIT command. Once in Form Setup mode you can call any commands for defining the form’s properties, creating a menu bar (see BAR object), main and popup menus (see MENU object) and any gadgets which it is to own.

Once-only form attributes are entered as part of the SETUP FORM command line; modifiable attributes are entered as contents of the form.

You can define the FORM to be either PML-controlled, or core-code controlled using the qualifier attribute *control type*, with values ‘PML” or “CORE”.

NOALIGN

The gadgets BUTTON, TOGGLE, TEXT, OPTION, single line PARGRAPH fit within 1 vertical grid unit and are by default drawn with their Y-coordinate adjusted so that they would approximately centre-align with an adjacent BUTTON. This pseudo-alignment introduces small errors in all but a few circumstances and prevents accurate controlled layout.

NOALIGN prevents this (historical) gadget auto-alignment.

Use NOALIGN in conjunction with PATH RIGHT (the default path) and HALIGN CENTRE, as it gives a better layout, with fewer surprises.

Note: It is bad practice to place one gadget on top of another. This may lead to gadgets being obscured.
The commands to set modifiable attributes are described after the syntax graph.

```
                              .---------------<--------------------------.
                             /                                           |
>--SETUP FORM fname --+-- MAIN -----+------------------------------|
                      +-- DOCUMENT -+- FLOAT ----------------------|
                      |             ‘------------------------------|
                      +-- DIALOG ---+- DOCKing -+------------------|
                      |                         |- Left ---.       |
                      |             |           |- Right --|       |
                      |             |           |- Top ----|       |
                      |             |           ‘- Bottom -‘--------|
                      |             |- RESIzeable -----------------|
                      |             ‘------------------------------|
                      +-- BLOCKingdialog -+- RESIzeable -----------|
                      |                   ‘------------------------|
                      +-- AT <xypos> ------------------------------|
                      +-- SIZE val val ----------------------------|
                      +-- NOQUIT ----------------------------------|
                      +-- NOALIGN ---------------------------------|
                      +-- CORE ------------------------------------*
                      | .---<------.
                      |/           |
                      +-- <form> --*   form contents
                      ‘—EXIT -->
```

Default: Dialog, non-resizeable; size adjusted automatically to fit contents.

CANCELCALL

This command defines the callback string which is executed whenever the form is dismissed from the screen via the CANCEL button or the QUIT/CLOSE control on the window title bar.

```
>-- CANCELcall text -->
```

Note: This command overrides the callback string on the CANCEL button.

CURSORTYPE

When a screen cursor enters a view, the view gadget determines what cursor type should be displayed initially, and what type will be displayed during different types of graphical interaction. You can specify the initial setting for the cursor type using this command.

Note: You cannot specify an initial cursor type for VOLUME views.

```
>-- CURSortype  --+-- POINTER ----.
                  +-- NOCURSOR ---|
                  +-- PICK -------|
                  +-- PICKPLUS ---|
                  ‘-- CROSSHAIR --‘-->
```

Note: There are other cursor types that are for AVEVA’s use only.

HALIGN

Works in conjunction with PATH and HDISTANCE. Defines how a newly added gadget should be aligned horizontally with the preceding gadget.

```
>-- HAlign --+-- Left ---.
             ‘-- Right --‘-->
```

HDISTANCE

Works in conjunction with PATH and HALIGN. Defines how a newly added gadget should be spaced horizontally with respect to the preceding gadget.

```
>-- HDistance value -->
```

ICONTITLE

Defines the title for the icon when the form is minimised.

```
>-- ICONTItle text -->
```

INITCALL

Defines the callback string that is executed each time the form is displayed. This callback is usually run to check the validity of showing the form and to initialise gadget values.

```
>-- INITcall text -->
```

OKCALL

Defines the OK callback string for a form. It is executed whenever the form is dismissed from the screen via its OK button or that of an ancestor.

```
>-- OKcall text -->
```

Note: This command overrides the callback string on the OK button.

PATH

Defines the direction in which a sequence of new gadgets is to be added to a form. The path setting remains until you give another PATH command. Used with HALIGN, HDISTANCE, VALIGN, VDISTANCE.

```
>-- PATH --+-- Up ------.
           +-- Down ----|
           +-- Left ----|
           ‘-- Right ---‘-->
```

Default: Path Right.

TITLE

Defines the form title.

```
>-- TITLe text -->
```

VALIGN

Use in conjunction with PATH and VDISTANCE. Defines how a newly added gadget should be aligned vertically with the preceding gadget.

```
>-- VAlign --+-- Top -----.
             ‘-- Bottom --‘-->
```

VDISTANCE

Works in conjunction with PATH and VALIGN. Defines how a newly added gadget should be spaced vertically with respect to the preceding gadget.

```
>-- VDistance value -->
```

FirstShown and Killing Events

The following actions determine the life of a form:

Define	the form, its gadgets, methods and layout are specified (usually in a '.pmlfrm' file)
Load	the form definition is read by PML and the form's constructor method is run
Show	the form's INITialisation event is raised, and the display process is begun
Activate	the form and its contents is created by the window management system and is activated (actually displayed) and the FIRSTSHOWN event is raised

Hide	the form is hidden and its OK or CANCEL event is raised
Kill	the form's KILLING event is raised and then the form is destroyed. It is no longer known to PML

Notes:

1. Load, Activate and Kill only happen once in the life of a form
2. Show and Hide may happen repeatedly
3. The form's Constructor is run once only
4. The FirstShown event only happens once
5. INIT is raised for every Show

The PML user can define callbacks to service any or all of the above events. These will typically be open callbacks supported by form methods. They can be assigned within the form's Constructor method (recommended), or within the form's Setup Form . . . Exit block.

FIRSTSHOWN callback

Typically assigned in the Constructor by

```
!this.FirstShownCall = '!this.<form_method>'
```

The purpose is to allow the user to carry out any form actions which can only be completed when the form is actually displayed. There are a variety of circumstances where this arises and it is often difficult to find a reliable solution. A couple of examples are given below.

Commands which manipulate form, menu or gadget visual properties, executed from a PML macro, function or callback may not happen until control is returned to the window manager's event loop. For example, in the application's start-up macro the command sequence show !!myForm … hide !!myform will result in the form not being displayed, but also not becoming known at all to the window manager. Attempts to communicate with this form via the External callback mechanism (possibly from another process) will not work. This can be rectified by doing the '!this.hide()' within the FIRSTSHOWN callback, because the form will be guaranteed to be actually displayed (and hence known to the window manager), before it is hidden.

It is sometimes difficult to achieve the correct gadget background colour setting the first time the form is displayed. This can be resolved by setting the required colour in the FIRSTSHOWN callback.

KILLING callback

Typically assigned in the Constructor by

```
!this.KillingCall = '!this.<form_method>'
```

The purpose is to notify the form that it is being destroyed and allow the assigned callback method to destroy any associated resources, e.g. global PML objects which would otherwise not be destroyed. This may be necessary because PML global objects will survive an application module switch, but may not be valid in the new module.

Notes:

1. The callback method **MUST NOT** carry out any modifications to the Gadgets belonging to the form or to the Form itself (e.g. don't show or hide the form). Attempts to edit the form or its gadgets may cause unwanted side effects or possible system errors.

2. Form callbacks designed for other Form events (e.g. CANCEL, INIT) are rarely suitable as killing callbacks.
3. Restrict form and gadget operations to querying.

2.5.25 FORMAT Object

Members

Name	**Type**	**Purpose**
`CompSeparator`	STRING | |	Separator used for multi-component data types such as POSITIONS (Default SPACE).
`Denominator`	REAL 32	Largest denominator for Imperial fractions (Default 32)
`Dimension`	STRING 'NONE' L L2 L3	Number is un-dimensioned (Default) Number is a LENGTH Number is an AREA Number is a VOLUME
`DP`	REAL 2	Number of decimal places for decimal fractions (Default 2)
`ENU`	BOOLEAN TRUE FALSE	Use ENU format when outputting POSITIONS (Default) Use XYZ format when outputting POSITIONS
`Fraction`	BOOLEAN FALSE TRUE	Fractional part output as decimal (Default) Fractional part output as fraction
`FtLabel`	STRING |'|	Label used for feet e.g. ' or FT or ft or feet (Default ')
`InchSeparator`	STRING |.|	Separator between inches and fractions (Default .)
`Label`	STRING |mm|	General distance label e.g. mm or m or " or IN (Default is no label)

Name	Type	Purpose
`PadFractions`	BOOLEAN FALSE TRUE	Do not pad Fractions (Default) Pad Fractions with trailing spaces
`Units`	STRING MM M FINCH INCH	Output number in millimetres (Default) Output number in metres. Output number in feet and inches Output number in inches
`OriginExp`	BLOCK || |/*| |CE|	With respect to World (Default) With respect to World With respect to Current Element
`Zeros`	BOOLEAN TRUE FALSE	Leading zeroes are displayed for Imperial units (Default). Leading zeroes are not displayed for Imperial units

Table 2: 42. FORMAT Object Members

2.5.26 FRAME Gadget

Members

Name	**Type**	**Purpose**
`Tag`	STRING Get/Set	Text to appear as title on the frame.
`Val`	REAL Get/ Set	Selected radio button index as integer.
`RGroupCount`	REAL Get only	Count of radio buttons (RTOGGLES) within the FRAME's radio group. Returns zero if the FRAME is not a radio group.
`Callback`	STRING Get/Set	Radio group select callback string.
`Expanded`	BOOLEAN Get/Set	FoldUpPanel's expanded status

Table 2: 43. FRAME Gadget Members

Methods

Name	**Result**	**Purpose**
`Rtoggle( !index is REAL )`	GADGET	Returns the RTOGGLE gadget with index **!index**.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..

Table 2: 44. FRAME Gadget Methods

Command

The FRAME command defines a frame gadget.

A frame is a container which owns and manages any gadgets defined within its scope, including other frames.

The frame gadget properties **visible** and **active** will automatically apply to all of its children, but will not overwrite their corresponding property values.

There are five types of FRAME: NORMAL, TABSET, TOOLBAR, PANEL and FOLDUP PANEL.

- A NORMAL frame can contain any type of gadget, including other frames. It also behaves as a radio group, with radio buttons defined by the set of RTOGGLE gadgets that it directly contains. See the entry RTOGGLE Object for more about the RTOGGLE gadget.
- A TABSET frame can contain only tabbed page FRAMEs; you cannot nest them and they are not named.
- A TOOLBAR frame can contain only a subset of gadget types: BUTTON, TOGGLE, OPTION, and TEXT. It must have a name and can appear only on main forms.

```
                                          .---<-------.
                                         /            |
>--FRAME gname -+- TOOLBAR -+- tagtext -+- <toolbar> -* toolbar contents
                |                       '— EXIT -->
                |            .---<--------.
                |           /             |
                +- TABSET -+-- <fgpos> ---|
                |          +-- <fganch> --|
                |          +-- <fgdock> --|
                |          +-- <vshap> ---*
                |          | .---<--------.
                |          |/             |
                |          +-- <tabset> --|   tabbed frame contents
                |          +-- NL --------*
                |          '-- EXIT -->
                +- PANEL --+----------.
                |          '--INDENT--|
                +- FOLDUPpanel -------| .---<--------.
                                      |/             |
                                      +-- tagtext ---|
                                      +-- <fgpos> ---|
                                      +-- <fganch> --|
                                      +-- <fgdock> --|
                                      +-- <vshap> ---*
                                      | .---<--------.
                                      |/             |
                                      +-- <formc> ---* form contents
                                      '-- EXIT -->
```

where the sub-graphs <toolbar>, <tabset> and <formc> define the allowable gadgets and layout commands available within the specific container type.

Note: The graph <formc> defines the normal content of a form, all gadget types (except BAR) are allowed. There are restrictions on frame gadget types as defined below.

Setting Up a TOOLBAR Frame

The toolbar frame allows you to define formal toolbars that contain all the gadgets in the frame's scope. You can define a toolbar frame only for a main form, and a main form can contain only toolbar frames.

The graph below defines the allowable content of a toolbar frame:

```
>-- toolbar -+-- <fbutn> ----.        Button gadget
             +-- <ftext> ----|        text gadget
             +-- <ftogl> ----|        toggle gadget
             +-- <foptio> ---|        option gadget
             +-- <fvar> -----|        form variable definition
             +-- <pml> ------|        general PML
             +-- <nxasgn> ---|        PML expressions
             ‘-- <varset> ---‘---->   variable setting VARº
```

Setting Up a TABSET Frame

A TABSET frame defines a container for a set of tabbed page frames. It has no visible border and no name.

The graph below defines allowable contents of a TABSET frame:

```
>-- tabset >-+-- <fframe> ---.        frame gadget
             +-- <fvar> -----|        form variable definition
             +-- <pml> ------|        general PML
             +-- <nxasgn> ---|        PML expressions
             ‘-- <varset> ---‘---->   variable setting VARº
```

Note: Frame gadgets defined anywhere within the TABSET frame can only be of type NORMAL, not TOOLBAR or TABSET frames.
NORMAL frames defined directly within the TABSET frame, will appear as tabbed pages within it.

Setting up a Panel Frame

The panel is a rectangular region within a form which can contain the normal form gadgets, but doesn't have to be enclosed in a solid-line box.

Notes:

1. After choosing frame type Panel, the contents is defined in the usual manner.
2. Tagtext can be specified, but it is never displayed.
3. The panel has no visible enclosing box, unless the INDENT option is specified when it will have a 3D indented appearance.
4. Panel supports all the attributes of a Normal Frame including the notion of a radio button group.

Setting up in Fold Up Panel

This is a rectangular panel with a visible title bar, and border. The following form in this section below shows examples of fold-up panel frame gadgets.

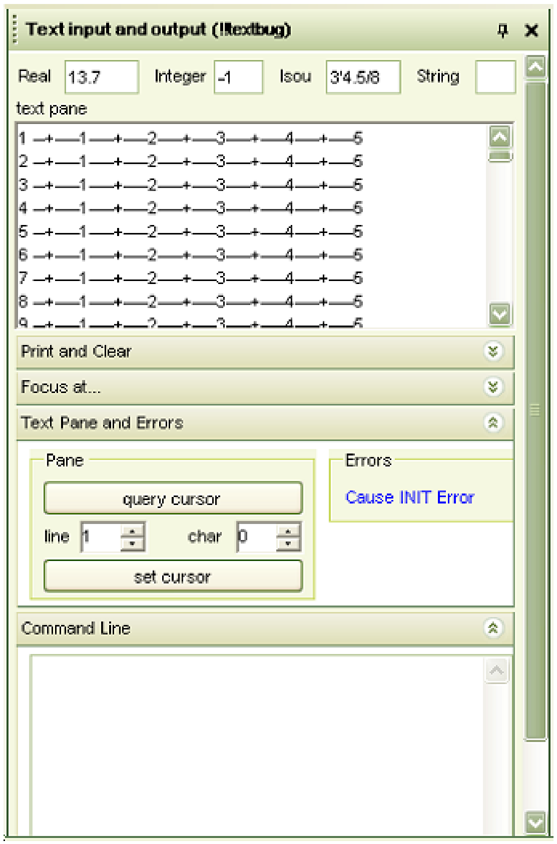
Notes:

1. After choosing frame type FoldUpPanel, the contents is defined in the usual manner. The panel can contain the usual PML gadgets except another FoldUpPanel.
2. Separate events are raised after expanding or collapsing the panel.

3. The default state is 'expanded'.
4. When the panel expands or collapses, any gadgets which lie below the panel and between (or partially between) the panel's horizontal limits will be moved down or up the form.
5. If the form's AutoScroll attribute is selected, then a scroll bar will automatically appear whenever gadgets have been moved off the bottom of the form, so that all of the form is still accessible.
6. The FoldUpPanel supports all the attributes of a Normal Frame including the notion of a radio button group

The form shown below is a docking dialog which has four fold-up panels, the first two are collapsed (hidden) and the second two are expanded (shown). Each one has a title bar which displays the panel's tag text, and an icon which allows the panel to fold-up or fold-down when it is pressed. Note the use of the form's AutoScroll attribute and the resulting scroll bar.

The PML code for this example form is given in the file textbug.pmlfrm.


Text input and output (!!textbug)

Real 13.7 Integer -1 Isou 3'4.5/8 String

text pane

```
1 -+--1--+--2--+--3--+--4--+--5
2 -+--1--+--2--+--3--+--4--+--5
3 -+--1--+--2--+--3--+--4--+--5
4 -+--1--+--2--+--3--+--4--+--5
5 -+--1--+--2--+--3--+--4--+--5
6 -+--1--+--2--+--3--+--4--+--5
7 -+--1--+--2--+--3--+--4--+--5
8 -+--1--+--2--+--3--+--4--+--5
```

line 1 char 0

For frames which are FoldUpPanels, 'HIDDEN' and 'SHOWN' events are raised whenever the user interactively folds or unfolds the panel. These events are only fired if a PML open callback is defined.

This ensures that the SELECT event, used to signal selection of a radio button within a fold-up panel can still be handled by simple (non-Open) callbacks.

To manage FoldUpPanels which are also radio groups, then you must supply an open callback so that you can differentiate the panel's SELECT, HIDDEN and SHOWN events.

Tabbed Page Frame Visible Property and 'Hidden' event

The VISIBLE property allows a tabbed page to be selected and given focus, e.g.

    !this.TabbedPage.visible = true

When a tabbed page frame's tab is interactively selected, there is now a HIDDEN event raised when the currently shown page is hidden, followed by a SHOWN event when the newly selected page is shown. These events are only raised if a PML open callback has been assigned.

2.5.27 Graphical Selection

The Selection object allows the PML user to interact with the graphical selections set. It is not reliant on PDMS being in graphical mode - the selection set can be created and manipulated in TTY mode, and thus can be used in regression tests.

Only significant elements can be in selection sets. The definition of what is significant varies between graphical interaction modes:

- in Design navigate mode, all database elements are significant
- in Model Editor mode, then only those database elements defined in the Model Editor definition are significant, and some non-database elements.
- In Draft mode, only drawlist elements are significant.

Most methods look for the 'highest significant element' - they climb up the ownership tree looking for significant elements, until the value of 'scope' is reached - the nearest significant element below this ceiling is used.

Set-up Methods

Name	Purpose
`.selection()`	Creates an empty selection object .

Methods that Modify Object

Note that this object is manipulating the graphical selection set itself. As elements are added or removed, they will be highlighted in the graphics view at the same time (if in graphics mode).

Name	Result	Purpose
`.scope(DBREF)`	BOOLEAN	Defines the scope of the selection, i.e. defines the top element that the selected elements must exist beneath. Default is WORLD.
`.add(DBREF)`	DBREF	Adds the highest significant parent of passed element to selection

`.addConnected(DBREF)`	ARRAY	Simulates "Select connected" for piping components: Adds the given component and the connected network relative to the component
`.addBranchLeg(DBREF)`	ARRAY	Simulates "Select leg" for piping components: Adds the given component and adjacent components within the branch which are in the same leg as the passed component
`.addAttached(DBREF)`	ARRAY	Simulates "Select attached" for sections: Adds the given section and all sections attached into the selection
`.addOffspring(DBREF)`	ARRAY	Adds the highest significant sub-elements of given element to selection. This action as if DBREF were ancestor for select
`.remove(DBREF)`	No Result	Remove highest significant parent of passed element from selection
`.clear()`	No Result	Empty the selection
`.getCurrent()`	No Result	Set the contents of the selection to the contents of the current graphical selection set
`.getAll()`	No Result	Set the selection set to contain the entire drawlist
`.setCurrent()`	No Result	Set the current graphical selection set to be the same as the contents of the selection set

Query Methods

Name	Result	Purpose
`.isValid()`	BOOLEAN	Is the selection valid. (This is a standard method, and should not normally need to be called)
`.selected(DBREF)`	DBREF	Returns highest significant parent of given element, i.e. the element which will be included in the selection
`.isSelectable(DBREF)`	BOOLEAN	Returns true if the given element is in itself selectable within the scope of the selection
`.isModifiable(DBREF)`	BOOLEAN	Returns true if the highest significant parent of the given element is modifiable
`.inSelection(DBREF)`	BOOLEAN	Returns true if the given element exists in the selection
`.ancestors(DBREF)`	ARRAY of DBREFs	Returns list of permissible ancestors for given element, within the current scope
`.getSelection()`	ARRAY of DBREFs	Returns all elements in the selection

Table 2: 45. Graphical Selection Object Methods

2.5.28 IDList

The IDList object provides features for the accessing and manipulation of elements in an IDLIST database element.

Elements in the IDlist object must be significant elements, in the following sense. The database element reference supplied to the constructor is examined to see if it either:

- Owns a valid design drawlist element; in which case the supplied element is added to the idlist object.
- Is owned by a drawlist element, in which case the significant owner is added to the idlist.

Elements below the level of the design drawlist element cannot be manipulated via this object.

Set-up Methods

Name	Purpose
.idlist(DBREF)	Creates an PML IDlist object from the given DBREF of an IDLIST. Searches up the ownership hierarchy until a significant element is found, and adds this to the Idlist.

Before adding an ADDE, the object will check whether there is an 'active' ADDE in the list - this is an ADDE for the identical element, without an intervening REME for the same object. If so, it will not add it again. Similarly for REMEs.

When removing ADDEs or REMEs, the system will start from the bottom of the list and work backwards removing the requested entry.

Access Methods

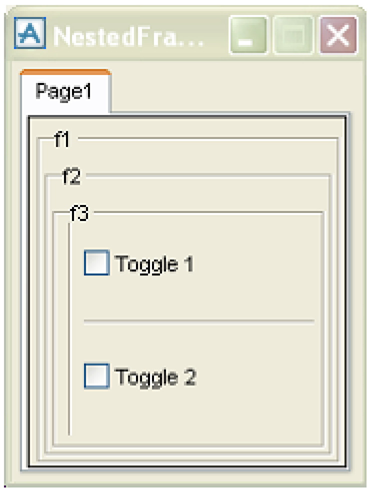
Name	Result	Purpose
`.add (DBREF)`	No Result	Adds a ADDE to the IDLIST. If there is already an ADDE of either the same element or one of its ancestors (without an intervening REME) then nothing will be done. If there is an intervening identical REME, then the REME is removed.
`.add (SELECTION)`	No Result	Adds ADDEs for the entire selection set to the IDList at this point, in the same way as for individual DBREFs.
`.remove (DBREF)`	No Result	If there exists an ADDE for this element in the list, then it is removed. If there exists an ADDE for an ancestor for this element, then a REME is inserted.
`.remove (SELECTION)`	No Result	Removes all ADDEs defined in the selection set, using the same rules as in removing a single element.
`.copy(IDLIST other)`	BOOLEAN	Clears the idlist, and adds all the entries from idlist other. Returns TRUE if copy successful.
`.clear()`	No Result	Remove all elements from idlist
`.query()`	ARRAY of STRINGS	Returns an array of strings of the form: ADDE element or REME element itemising all the elements in the idlist.

Table 2: 46. IDlist Object Methods

2.5.29 LINE Gadget

Members and Methods

The LINE gadget supports the standard default gadget members and methods only.



Command

The Line gadget gives the ability to display horizontal or vertical lines to separate groups of gadgets on a form, for increased clarity of intent. The line's presentation reflects the colour of the current Windows scheme.

```
                              .-------<--------------.
                             /                        |
>--- LINE gname -+- tagtext ---------------|
                 +- <fgpos> ---------------|
                 +- <fganch> --------------|
                 +- <fgdock> --------------*
                 |
                 +- VERTical ---.
                 |              |
                 '- HORIZontal -'- <vshap> -->
```

Example: The form 'Nested Frames' above shows a vertical LINE and a horizontal LINE. The code snippet below shows the construction of the innermost frame f3.

```
frame .f3  'f3'
   vdist 0.2
   hdist 0.5
   toggle .t1  'Toggle 1'  at x 2
   line .horiz  'H-Line'  Horiz  wid.f3  hei.t1
   toggle .t2 'Toggle 2'
   line .vert  at xmin.f3 ymin.f3+0.5  Vert  wid 2  hei.f3
exit
```

Notes:

1. The tag text is never displayed.
2. Line does not apply to toolbars.
3. The graph <vshap> allows the line's width and height to be set either specifically or in terms of other gadgets on the form.
4. Setting the height for a Horizontal separator or the width for a Vertical separator causes the line to be drawn across the middle of the implied area. This allows for equal spacing on each side of the separator line. Otherwise a default width or height is assumed.
5. The Dock and Anchor attributes allow the Lines to be dynamic and respond to interactive changes in form size.
6. The gadget is not interactive and has no associated value.

2.5.30 LINE Object

See also the POINTVECTOR object.

Members

Name	Type	Purpose
`StartPosition`	POSITION Get/Set	Start position of line.
`EndPosition`	POSITION Get/Set	End position of line.

Table 2: 47. LINE Object Members

Definition Methods

None of these methods modifies the original object.

Name	Result	Purpose
`Line( POSITION first, POSITION second)`	LINE	Creates a LINE between the given positions, **first** and **second**.
`String()`	STRING	Returns the line as a STRING.
`Direction()`	DIRECTION	Returns a DIRECTION representing the direction of the line.
`Direction(DIRECTION way)`	LINE	Creates a new line with the same start position and length but in the direction given by **way**.

Table 2: 48. LINE Object Definition Methods

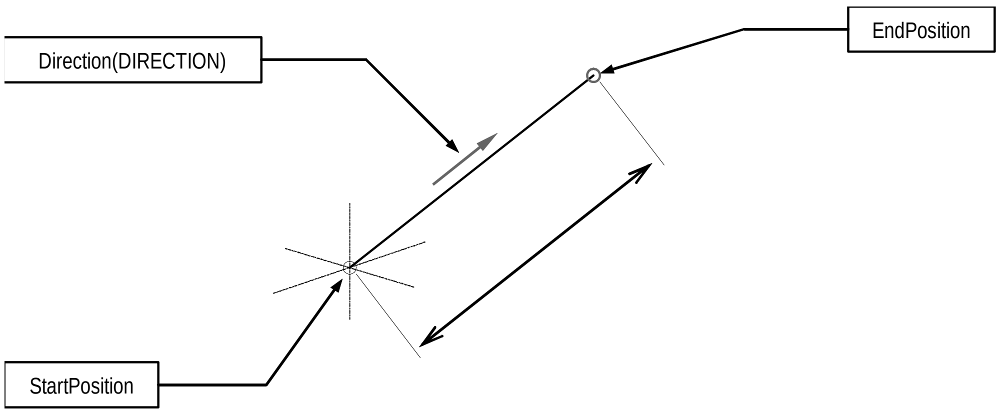


Figure 2:20.   : Basic LINE Definition

LINE Object Methods that Return BOOLEANs

None of these methods modifies the original object.

Name	Result	Purpose
`On(POSITION where)`	BOOLEAN	Returns TRUE if **where** lies on the bounded line.
`OnProjected(POSITION where)`	BOOLEAN	Returns TRUE if **where**, when projected onto the line, lies within the bounded line.

Figure 2:21.   LINE Object Methods that Return BOOLEANs

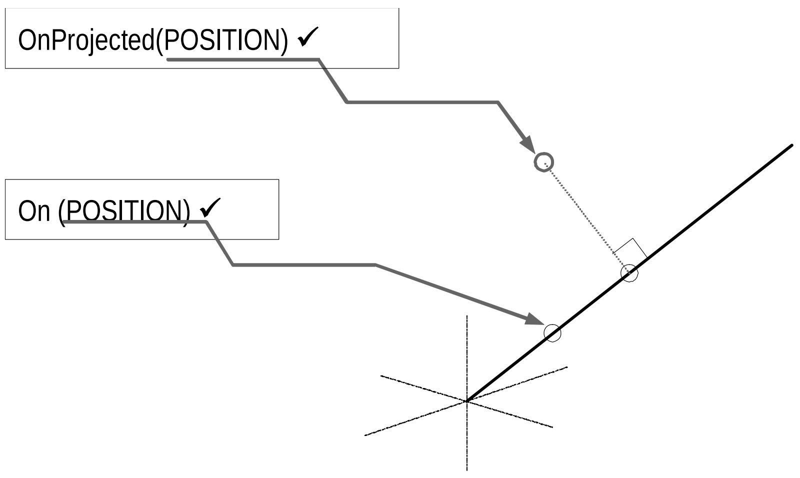


Figure 2:22.   BOOLEANs Returned by LINE Object Methods

LINE Object Methods that Return POSITIONs

None of these methods modifies the original object.

Name	Result	Purpose
`Intersection(LINE other)`	POSITION	Returns the intersection point of the passed LINE on the line definition
`Intersection(POINT point, VECTOR vector)`	POSITION	Returns the intersection point of the passed POINTVECTOR on the line definition.
`Intersection(PLANE plane)`	LINE	Returns the intersection line of **plane** on the line definition.
`Intersections(ARC arc)`	ARRAY OF POSITIONS	Returns the intersection points of **arc** on the line definition.
`Near(POSITION position)`	POSITION	Returns the nearest position on the line definition to **position**.
`Proportion(REAL proportion)`	POSITION	Returns the position at **proportion** along the "bounded" line from the `StartPosition`. Values > 1 will give positions off the end of the line. Values < 0 will give positions off the start of the line.

Table 2: 49. LINE Object Methods that Return POSITIONs

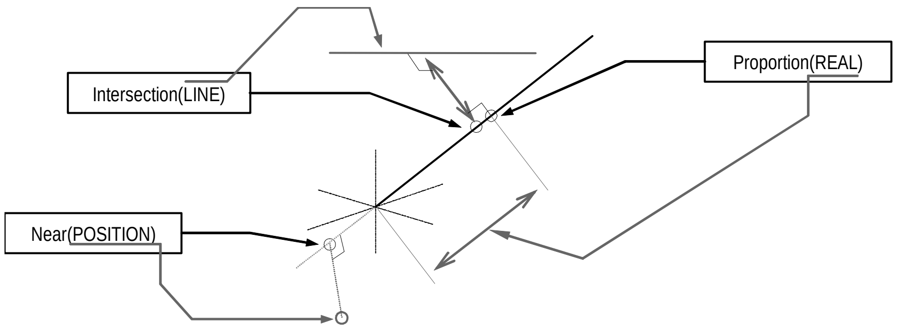


Figure 2:23. POSITIONs Returned by LINE Object Methods

LINE Object Methods that Return REALs

None of these methods modifies the original object.

Name	Result	Purpose
`Length()`	REAL	Returns the length of the line.
`Distance(LINE other)`	REAL	Returns the minimum distance between the line definition and **other**.
`Distance(POSITION position)`	REAL	Returns the minimum distance between the line definition and **position**.

Figure 2:24. Table -48: LINE Object Methods that Return REALs

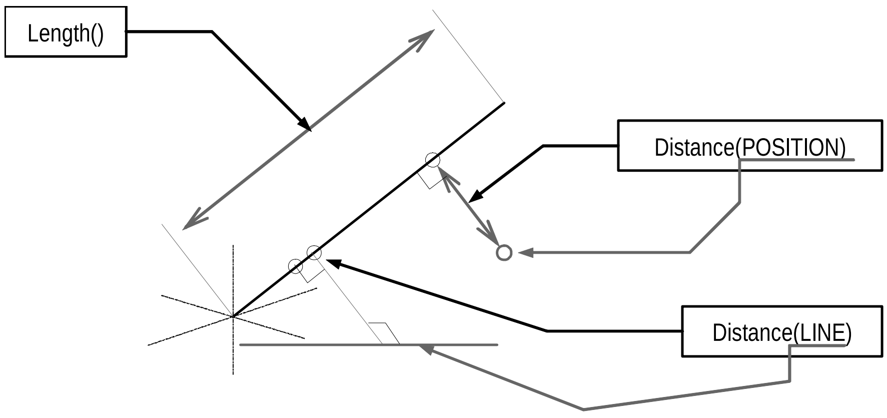


Figure 2:25. REALs Returned by LINE Object Methods

LINE Object: Miscellaneous Methods

None of these methods modifies the original object.

Name	Result	Purpose
`Plane()`	PLANE	Returns a plane object, using the **StartPosition** and Direction of line object
`Pointvector()`	POINTVEC TOR	Returns a POINTVECTOR object, using the **StartPosition** and Direction of line object

Figure 2:26. LINE Object Miscellaneous Methods

LINE Object Methods that Return LINEs (a)

None of these methods modifies the original object.

Name	Result	Purpose
`SetLengthStart(REAL length)`	LINE	Returns a new line, maintaining the original **StartPosition** and direction, with an **EndPosition** to match **length**.
`SetLengthEnd(REAL length)`	LINE	Returns a new line, maintaining the original **EndPosition** and direction, with a **StartPosition** to match **length**.
`Towards(POSITION position)`	LINE	Returns a new line object with the same **StartPosition** and the same relative **EndPosition** (Length) of the original line, but the direction is from the start position to **position.**
`From(POSITION position)`	LINE	Returns a line, where the **StartPosition** is set **position**, maintaining the original **EndPosition**.
`To(POSITION position)`	LINE	Returns a line, where the **EndPosition** is set to **position**, maintaining the original **StartPosition**
`ExtendStart(REAL distance)`	LINE	Returns a new LINE, where the **StartPosition** has been extended in the opposite direction of line by **distance.**
`ExtendEnd(REAL distance)`	LINE	Returns a new LINE, where the **EndPosition** has been extended in the direction of the line by **distance.**

Table 2: 50. LINE Object Methods that Return LINEs (a)

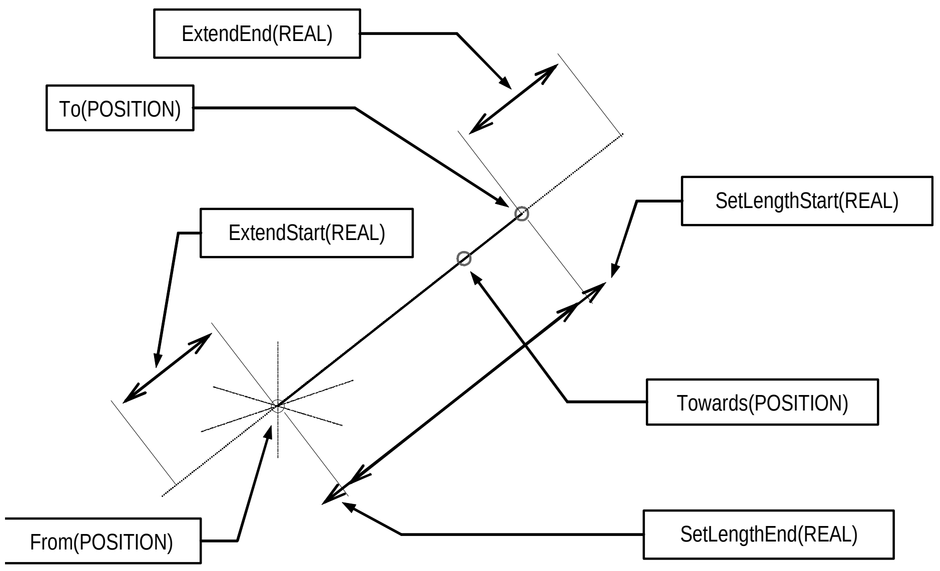


Figure 2:27. LINEs Returned by LINE Object Methods (a)

LINE Object Methods that Return Lines (b)

Name	Result	Purpose
`ExtendStart(PLANE plane)`	LINE	Returns a new LINE, where the **StartPosition** has been extended to **plane**.
`ExtendEnd(PLANE plane)`	LINE	Returns a new LINE, where the **EndPosition** has been extended to **plane**.
`ReverseSense()`	LINE	Returns a line, where the **StartPosition** and **EndPosition** have been transposed.
`Projected(PLANE plane)`	LINE	Returns a LINE definition normalised onto **plane**. See picture.
`Parallel(POSITION position)`	LINE	Returns a parallel to the line definition of the line object, through **position**. All other members are copied. See picture.
`Offset(DIRECTION direction, REAL offset)`	LINE	Returns a parallel line to the LINE object, offset by **offset** from the original in the given **direction**. See picture.

Figure 2:28. LINE Object Methods that Return LINEs (b)

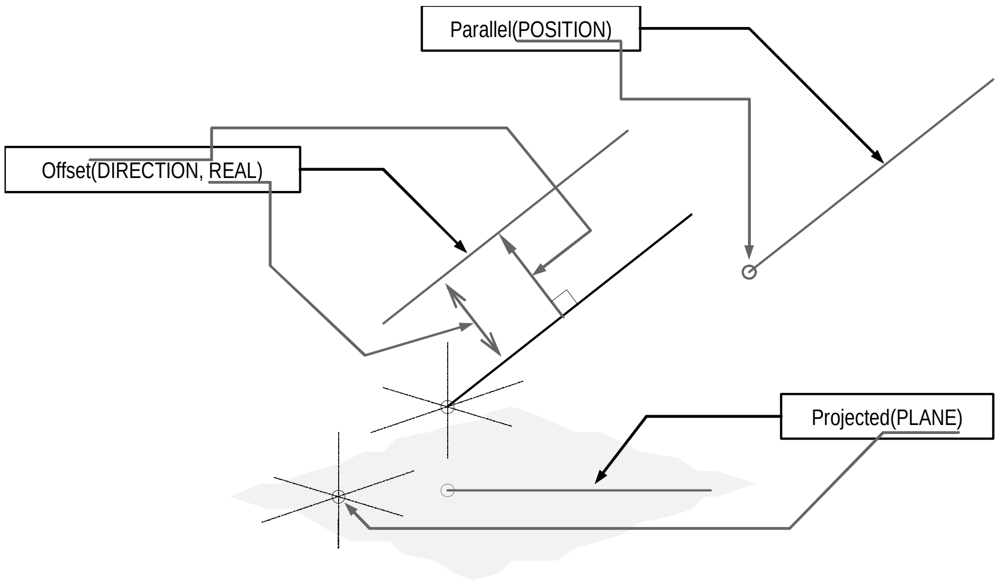


Figure 2:29. LINEs Returned by LINE Object Methods (b)

LINE Object Methods that Return Lines (c)

Name	Result	Purpose
`Overlap(LINE other)`	LINE	Returns the overlapping line of two ***parallel*** lines. All positions are return projected onto the original object. See picture.
`Union(LINE other)`	LINE	Returns the union of LINE and **other**. The two are ***parallel*** lines, all positions are return projected onto the original object. See picture.

Table 2: 51. LINE Object Methods that Return LINEs (c)

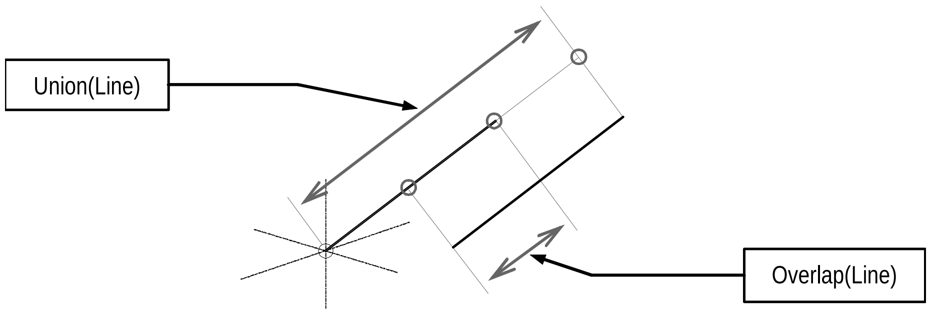


Figure 2:30. LINEs Returned by LINE Object Methods (c)

LINEARGRID Object Construction Aids

Members

Name	Type	Purpose
`Position`	POSITION Get/Set	Origin of the grid
`Orientation`	ORIENTATION Get/Set	Orientation of the grid
`XSpacing`	REAL Get/Set	Spacing in the X direction
`YSpacing`	REAL Get/Set	Spacing in the Y direction

Table 2: 52. LINEARGRID Object Members

Definition Methods

These methods do not modify the original object.

Name	Result	Purpose
`Lineargrid( POSITION, ORIENTATION, REAL, REAL)`	LINEARGRID	Creates a grid with the given POSITION, ORIENTATION, and X and Y spacing.
`String()`	STRING	Returns the grid as a string

Table 2: 53. LINEARGRID Object: Basic Members

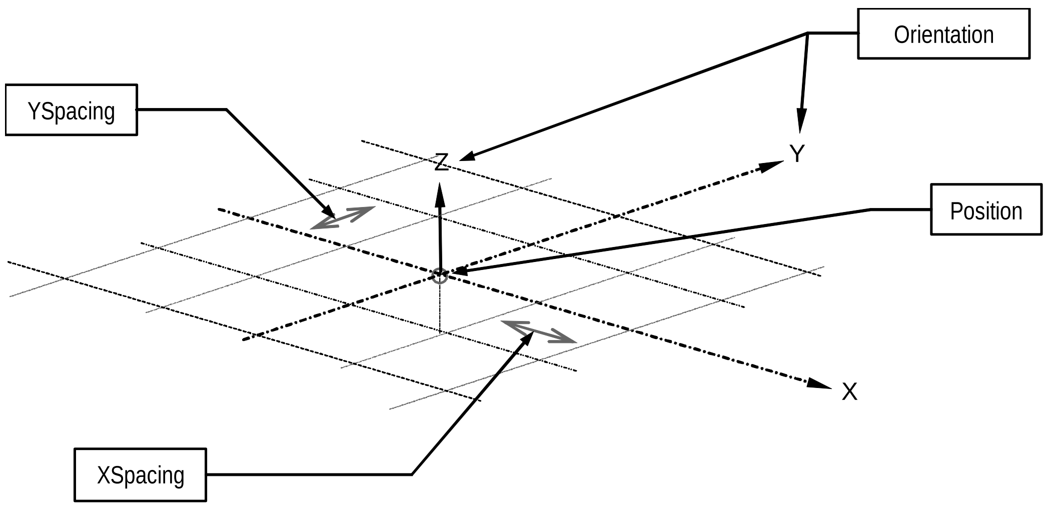


Figure 2:31. LINEARGRID Basic Definition

LINEARGRID Object Methods that Return POSITIONs

None of these methods modifies the original object.

Name	Result	Purpose
`GridPoint(REAL, REAL)`	POSITION	Returns the position at the intersection of the passed X and Y lines from the origin of the grid. Values can be +ve or -ve depending on the side of the origin
`Snap(POSITION)`	POSITION	Returns the nearest intersection point to the passed position, when mapped onto the grid plane
`Snap(LINE)`	POSITION	Returns the nearest intersection point to the intersection of the passed line and the grid plane
`Snap(POINTVECTOR)`	POSITION	Returns the nearest intersection point to the intersection of the passed point vector and the grid plane
`SnaptoCentre(POSITION)`	POSITION	Returns the nearest mesh cell centre point to the passed position, when mapped onto the grid plane
`SnaptoCentre(LINE)`	POSITION	Returns the nearest mesh cell centre point to the intersection of the passed line and the grid plane
`SnaptoCentre(POINTVECTOR)`	POSITION	Returns the nearest mesh cell centre point to the intersection of the passed point vector and the grid plane

Table 2: 54. LINEARGRID Object Methods that Return POSITIONs

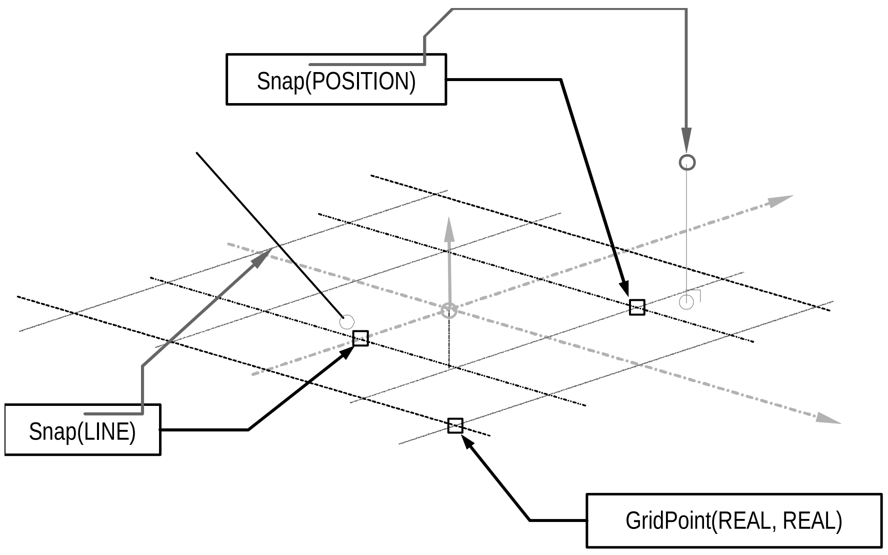


Figure 2:32. POSITIONs Returned by LINEARGRID Methods

2.5.31 LINEARGRID Object

This method does not modify the original object.

Name	**Result**	**Purpose**
`Plane()`	PLANE	Returns the grid as plane object

Table 2: 55. Miscellaneous LINEARGRID Object Methods

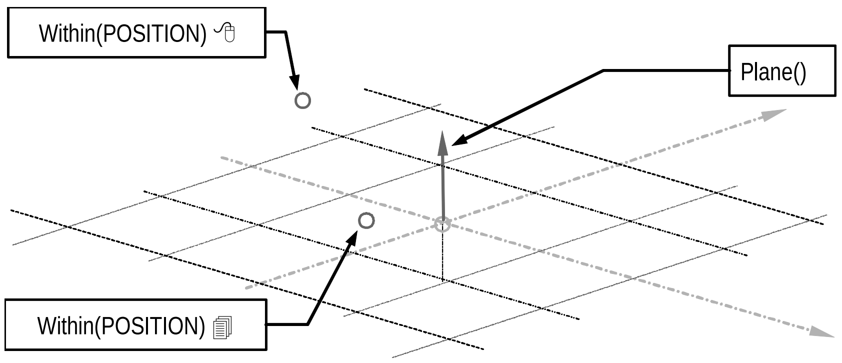


Figure 2:33. Miscellaneous Return Values from LINEARGRID Methods

LINEARGRID Object Methods that Return XYOffsets

This method does not modify the original object.

Name	Result	Purpose
`XYOffset(POSITION)`	XYPOSITIO N	Returns the position, mapped onto the grid plane, in terms of an XY offset from the grid plane origin

Table 2: 56. LINEARGRID Object Methods that Return XYOffsets

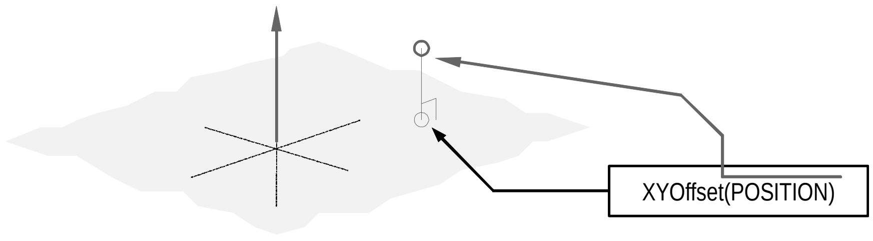


Figure 2:34. XYOffsets Returned by LINEARGRID Object Methods

2.5.32 LIST Gadget

Members

Name	**Type**	**Purpose**
`Val`	REAL Get/ Set	Selected field-number of a single-choice list.
`Val`	REAL ARRAY Get/ Set	Selected field numbers of a multiple-choice list.
`DText`	STRING ARRAY Get/ Set	Set or get the entire list of display texts.
`DText[n]`	STRING Get Only	Get the display text of the **n**'th field.
`PickedField`	REAL Get Only	Last picked list field number.
`RText`	STRING ARRAY Get/ Set	Set or get the list of replacement texts.
`RText[n]`	STRING et Only	Get the replacement text of the **n**'th field.
`Count`	REAL Get only	Get count of number of fields in the list
`val`	REAL Get/Set	Selected field as integer. Zero implies no selection. Setting val to zero will cause an error for mandatory selection lists.

Table 2: 57. LIST Object Members

Methods

Name	Result	Purpose
`Add(STRING Dtext)`	NO RESULT	Append an entry to the list, where **Dtext** is the text to display in the option list.
`Add(STRING Dtext, STRING Rtext))`	NO RESULT	Append and entry to the list, where **Dtext** is the text to display in the option list, and **Rtext** is the replacement text for the new field. If **Rtext** isn't specified, it will be set to **Dtext** by default.
`FullName()`	STRING	Get the full name of the gadget, e.g..'!!Form.gadget'
`Name()`	STRING	Get the gadget's name, e.g. 'gadget'
`Owner()`	FORM	Get owning form.
`Select(STRING text, STRING value)`	NO RESULT	Select specified item in a list. **text** must be 'Rtext' or 'Dtext'. **value** is the RTEXT or DTEXT of the item to be selected.
`Select(STRING text, ARRAY of STRING values)`	NO RESULT	Select multiple choice list items. **text** must be 'Rtext' or 'Dtext'. **values** contains the RTEXT or DTEXT values to be selected.
`Selection( )`	STRING ARRAY OF STRING	Get selected RTEXT Array of RTEXT for multi-choice list.
`Selection(STRING text)`	STRING ARRAY OF STRING	Get selected RTEXT or DTEXT Array of texts for multi-choice list. **text** must be 'Rtext' or 'Dtext'.
`Clear()`	NO RESULT	Clear list contents and selections.
`ClearSelection()`	NO RESULT	Clear list selections.
`SetPopup(MENU  menu)`	NO RESULT	Links **menu** with the gadget as a popup.

Name	Result	Purpose
`RemovePopup(MENU menu)`	NO RESULT	Removes popup **menu** from the gadget.
`GetPickedPopup()`	MENU	Returns the last picked popup menu for the gadget.
`Refresh()`	NO RESULT	Refreshes the display of the gadget.
`Shown()`	BOOLEAN	Get ‘shown’ status.
`Type()`	STRING	Get the gadget type as a STRING.
`SetToolTip(STRING)`	NO RESULT	Allows a TOOLTIP to be edited.
`SetFocus()`	NO RESULT	Move keyboard focus to this gadget.
`SetHeadings(!Dtexts is STRING)`	NONE	Specifies the number of columns and sets the list's column headings. Dtexts contains a set of TAB separated sub-strings.
`SetHeadings(!Dtexts is ARRAY)`	NONE	Specifies the number of columns and sets the list's column headings. Dtexts is an array of strings.
`Clear( !dtext )`	NO RESULT	Delete the field with the given DTEXT string.
`Clear( !fieldNumber )`	NO RESULT	Delete the specified field number.
`SetRows(Array of (Array of STRING))`	NO RESULT	This sets the display text for all the data fields of the list gadget by row. If the list gadget is already populated then it replaces all the current rows by the new ones. **Array** is an array of ‘row arrays’, and its size determines the number of rows in the list. Each entry is a row array of strings, which supplies the displayed text for each column of the row. The size of each row array must be less than or equal to the number of columns of the list. The columns are filled sequentially until the array is exhausted.

Name	Result	Purpose
`SetColumns(Array of (Array of STRING))`	NO RESULT	This sets the display text for all the data fields of the list gadget by column. If the list gadget is already populated then it replaces all the current rows by the new ones. **Array** is an array of 'column arrays', and its size must match the number of columns of the list. The size of each all column arrays must be the same and determines the no of rows in the list.
`Select(REAL column, STRING dtext)`	NO RESULT	This selects the first list row whose column **column** has the display text **dtext**. If the field is not found then the list selection is unaltered. If the list is a multi-choice list then repeated use of this method will add selections to the list.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..

Table 2: 58. LIST Object Methods

Column Headings

The number of columns is deduced from the List's data. If the user specifies a set of (1 or more) column headings before the list is populated, then this will determine the number of columns. If no headings are pre-specified then the number of columns is deduced from the display text (Dtext) of the List's first data field. This provides upwards compatibility for existing Appware using single column lists.

A List gadget's headings can be replaced after the list has been populated. If the new headings specify the same number of columns then the headings are replaced but the List's data fields and selection remain unchanged. If the number of columns is different, then the list is replaced by an empty list with the new headings.

Invoking the Clear() method will clear the list's data fields and rebuild the current headings.

There are two methods for defining a List's column headings:

The data fields can be set using the List's **DTEXT** member or its **Add** methods, where a row's Dtext string can be a set of TAB separated column sub-strings for populating multiple columns. Alternatively you can use the **SetRows** or **SetColumns methods**.

Single choice lists

Reselection of the Selected Field can be Disallowed

For Single choice lists there is a keyword NORESELECT which disables UnSelect and Select events when the currently selected field is clicked with the mouse, for example:

```
list .l1 |List gadget| zeroSel noReselect width 15 length 5 tooltip 'single choice list'
```

De-selection of the selected field for ZeroSelection lists

For ZeroSelection lists it is possible to interactively deselect the selected field by clicking in unused rows or after the last column.

The val member now allows programmatic de-selection of the current field.

Unselect Events

Single choice List gadgets support UNSELECT events. Typically when a field is selected, an UNSELECT event is raised for the previously selected field (if any) and then a SELECT event is raised for the new field. An UNSELECT event is raised whenever a selected field is interactively deselected.

Notes:

1. UNSELECT events are not notified to PML unless an open callback has been specified (so that SELECT and UNSELECT events can be differentiated).
2. Typically the UNSELECT action allows Appware to manage consequences of deselection for any dependent gadgets or forms.
3. We recommend that you do not change the List's selection programmatically in an UNSELECT event.

Command

The LIST command defines a single-choice or multiple-choice list gadget, and specifies its position, tag, number of columns and callback text. Also defines the area (width and height) in which the displayed part of the list will appear.

The arrays defining the display texts and replacement texts for the list options are usually set in the form's default constructor method.

```
                          .-------<--------.
                         /                 |
>- <flist> - LIST gname -+- <fgtagw> ------|
                         +- <fgpos> -------|
                         +- <fganch> ------|
                         +- <fgdock> ------|
                         +- CALLback text -|
                         +- TOOLTIP text --|
                         +- CORE ----------* Core managed gadget
                         |
                         +- MULTiple --------.
                         | .-------<-------. |
                         |/                | |
                         +- NORESELect ----| |
                         +- ZEROSELection -* |
                         ‘-------------------‘- <vshap> +- TOOLTIP text -.
                                                        ‘----------------‘->
```

Figure 2:35. Syntax Graph -: Setting-up a LIST Object

Note: The TOOLTIP keyword can be given at two different places in the syntax.

Default: A single choice, mandatory selection list.

2.5.33 LOCATION Object

Members

Name	Type	Purpose
`Name`	STRING	Location name.
`Description`	STRING	Description, up to 120 characters.
`Locid`	STRING	Location identifier.
`Refno`	STRING	STRING containing Database reference no.
`IsCurrent`	BOOLEAN	True for the current Location.

Table 2: 59. LOCATION Object members

Methods

Name	Result	Purpose
`LOCATION(DBREF)`	LOCATION	Returns a LOCATION object, given a DBREF.
`LOCATION(STRING)`	LOCATION	Returns a LOCATION object, given a name or reference number (Global projects only).
`Dblist()`	ARRAY OF DB	Array of DB objects for Allocated DBs. This method does not modify the original object.
`Sessions()`	ARRAY OF SESSIONS	Return array of all Sessions extracted from COMMs db at the Location. This method does not modify the original object.
`String()`	STRING	STRING containing Location name. This method does not modify the original object.

Table 2: 60. LOCATION Object Methods

Note: The `Sessions()` method provides information required for remote expunging. This method will cause daemon activity for locations other than the current location.

You can use the constructors in the following ways:

```
!D = OBJECT LOCATION(!!CE)
!D = OBJECT LOCATION(!!CE.Name)
!D = !!CE.LOCATION()!D = !!CE.Name.LOCATION()
```

In all cases, **!!CE** is assumed to be a DB database element and **!!CE.Name** is a STRING object containing the element's name.

These methods should assist performance improvements to AppWare by making it easier to get from Database element to Object.

2.5.34 MACRO Object

Member

Name	Type	Purpose
`Filename`	STRING	Inter-DB macro filename (up to 17 characters).
`From`	DB	Source DB of inter-DB connection macro.
`Number`	REAL	Inter-DB macro number.
`To`	DB	Target DB of inter-DB connection macro.

Table 2: 61. MACRO Object Members

Command

```
!ARRAY = MACROS         $ Returns an array of all the MACRO objects in
                        $ the project
```

2.5.35 MDB Object

Member

Name	Type	Purpose
`Name`	STRING	Name of the MDB, up to 32 characters
`Description`	STRING	MDB description, up to 120 characters
`Refno`	STRING	String containing Database reference number

Figure 2:36. MDB Object Members

Methods

None of these methods modifies the original object.

Name	Result	Purpose
`MDB(DBREF)`	MDB	Returns an MDB object, given a DBREF.
`MDB(STRING)`	MDB	Returns an MDB object, given a name or reference number.
`Current()`	ARRAY OF DBS	Current databases as an array of DB objects
`Deferred()`	ARRAY OF DBS	Deferred databases as an array of DB objects
`Mode()`	ARRAY OF STRINGS	Returns 'NR' or 'RW' for each current DB of the MDB

Table 2: 62. MDB Object Methods

You can use the constructors in the following ways:

```
!D = OBJECT MDB(!!CE)
!D = OBJECT MDB(!!CE Name
!D = !!CE.MDB()
!D = !!CE.Name.MDB()
```

In all cases, **!!CE** is assumed to be a DB database element and **!!CE.Name** is a STRING object containing the element's name.

These methods should assist performance improvements to AppWare by making it easier to get from Database element to Object.

Command

```
!ARRAY= MDBS          $ Returns an array of MDB objects in the project
```

2.5.36 MENU Object

Members

Name	Type	Purpose
`Callback`	STRING Get/Set	Sets/gets the callback on the menu.
`PickedField`	STRING Get Only	Returns the DTEXT of the last picked menu field. **Using this member is now deprecated. Use the PickedFieldName property instead.**
`PickedFieldName`	STRING Get Only	Returns the field name of the last-picked TOGGLE or CALLBACK field.

Table 2: 63. MENU Object Members

Methods

Name	Result	Purpose
`Add('SEPARATOR', {STRING fieldName})`	NO RESULT	Append a SEPARATOR field, with an optional STRING argument, **fieldName**, that if present denotes the unique field-name in the menu.
`Add('CALLBACK', STRING Dtext, STRING callback, {STRING fieldName})`	NO RESULT	Append a CALLBACK field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank. The argument **callback** gives the callback command. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.

Name	Result	Purpose
`Add('FORM', STRING Dtext, STRING formName, {STRING fieldName})`	NO RESULT	Append a FORM display field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank. The argument **formName**, gives the name of the form to be displayed, which may be NULL but may not be blank. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu
`Add('MENU', STRING DText, STRING menuName, {STRING fieldName})`	NO RESULT	Append a MENU (pullright) field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank. `menuName` gives the pullright menu name, which may be NULL but may not be blank. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.
`Add('TOGGLE', STRING Dtext, STRING callback, {STRING fieldName})`	NO RESULT	Append a TOGGLE field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank. The argument **callback** gives the callback command, which must be an open PML function. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.
`Clear()`	NO RESULT	Removes all menu fields from the menu. **Using this method is deprecated**.

Name	Result	Purpose
`Clear(STRING  Dtext)`	NO RESULT	Removes menu fields starting with the one that matches **Dtext** onwards. **Using this method is deprecated**
`FieldProperty(STRING menuField, STRING property)`	BOOLEAN	Get the value of the property named in **property** for the menu field named in **menuField**. The allowed values for **property** are 'ACTIVE', 'VISIBLE', or 'SELECTED'.
`FullName()`	STRING	Returns menu object's full name, for example: '!!Form.Menu'.
`InsertAfter(STRING menuField, 'CALLBACK', STRING Dtext, STRING callback, {STRING fieldName})`	NO RESULT	Insert a CALLBACK field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank, immediately after the menu field identified by **menuField**. The argument **callback** gives the callback command. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.
`InsertAfter(STRING menuField, 'FORM', STRING Dtext, STRING formName, {STRING fieldName})`	NO RESULT	Insert a FORM display field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank, immediately after the menu field identified by **menuField**. The argument **formName** gives the name of the form. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.

Name	Result	Purpose
`InsertAfter(STRING menuField, ‘MENU’, STRING Dtext, STRING menuName, {STRING fieldName})`	NO RESULT	Insert a MENU (pullright) field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank, immediately after the menu field identified by **menuField**. The argument **menuName** gives the name of the form. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.
`InsertAfter(STRING menuField, ‘TOGGLE’, STRING Dtext, STRING menuName, {STRING fieldName})`	NO RESULT	Append TOGGLE field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank, immediately after the menu field identified by **menuField**. The argument **callback** gives the callback command, which must be an open PML function. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.
`InsertAfter(STRING menuField, ‘SEPARATOR’, {STRING fieldName})`	NO RESULT	Append a SEPARATOR field immediately after the menu field identified by **menuField**. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.

Name	Result	Purpose
`InsertBefore(STRING menuField, ‘CALLBACK’, STRING Dtext, STRING callback, {STRING fieldName})`	NO RESULT	Insert a CALLBACK field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank, immediately before the menu field identified by **menuField**. The argument **callback** gives the callback command. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.
`InsertBefore(STRING menuField, ‘FORM’, STRING Dtext, STRING formName, {STRING fieldName})`	NO RESULT	Insert a FORM display field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank, immediately before the menu field identified by **menuField**. The argument **formName** gives the name of the form. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.
`InsertBefore(STRING menuField, ‘MENU’, STRING Dtext, STRING menuName, {STRING fieldName})`	NO RESULT	Insert a MENU (pullright) field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank, immediately before the menu field identified by **menuField**. The argument **menuName** gives the name of the form. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.

Name	Result	Purpose
`InsertBefore(STRING menuField, 'TOGGLE', STRING Dtext, STRING menuName, {STRING fieldName})`	NO RESULT	Append TOGGLE field with **Dtext**, which may contain multi-byte characters, but which cannot be NULL or blank, immediately before the menu field identified by **menuField**. The argument **callback** gives the callback command, which must be an open PML function. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.
`InsertBefore(STRING menField, 'SEPARATOR', {STRING fieldName})`	NO RESULT	Append a SEPARATOR field immediately before the menu field identified by **menuField**. There is also an optional **fieldName** argument that, if present, denotes the unique field name in the menu.
`Name()`	STRING	Returns menu object's simple name, for example: 'Menu'.
`Owner()`	FORM	Returns reference to owning form.
`PopupGadget()`	GADGET	Returns the name of the gadget that popped up the menu. The value is unset if the menu was not popped up by a gadget.
`Refresh()`	NO RESULT	Refreshes the display of the gadget.
`Select(STRING Dtext, BOOLEAN status)`	NO RESULT	Set the selected status of TOGGLE field identified by **Dtext** to the value of **status**. **Using this method is deprecated.**
`Selected( STRING Dtext )`	BOOLEAN	Get selected status of the TOGGLE field identified by **Dtext**. **Using this method is deprecated.**

Name	Result	Purpose
`SetActive(STRING Dtext, BOOLEAN active)`	NO RESULT	Set the active status of the menu field identified by **Dtext**. **Using this method is deprecated.**
`SetFieldProperty(STRING menuField , STRING property, BOOLEAN value)`	NO RESULT	Set the value of **property** with **value**, for the menu field identified by **menuField**. The allowed values for **property** are 'ACTIVE', 'VISIBLE', or 'SELECTED'. But see the note below for special cases when you use a SEPARATOR field.

Table 2: 64. MENU Object Methods

Note: Setting the **Active** and **Visible** properties of a SEPARATOR field will affect the implied group of fields comprising the SEPARATOR field and all subsequent fields up to but not including the next SEPARATOR field.
For each of the `Add()` methods above, you can use a special field-type to indicate that the field is managed by core-code i.e. CORESEPARATOR, CORECALLBACK, COREFORM, COREMENU, and CORETOGGLE.
You do not need to specify callback functions for core-managed fields.

Command

MENU objects are owned by **FORM** objects, and can be created within form setup mode. It is also possible to add a new menu to an existing form - usually for context sensitive popup menus.

The recommended way to create a menu and its fields, typically within form setup mode, is:

```
!menu = !this.newmenu( ‘Menu1’, ‘MAIN’ )
!menu.add( ‘CALLBACK’, ‘save’, ‘<callback>’, ‘field1’ )
!menu.add( ‘FORM’, ‘save as°’, ‘saveForm’, ‘field2’ )
```

Note:

- Each menu is either part of the Main menu system or part of the Popup menu system, but cannot belong to both.
- If you specify neither POPUP nor MAIN at setup time, then the menu’s usage is initially unknown. The system will attempt to deduce the usage type from the first action that references the menu.
- Menus in the Main system can only appear once. That is, a main system menu cannot be a sub-menu of several menus.
- Menus in the Popup system may appear only once in a given popup tree, but may be used in any number of popup trees.
- A menu cannot reference itself, either directly as a pullright of one of its own fields or be a pullright of another menu in its own menu tree.

- **You can add menu fields with an optional field-name. If you do not specify a field-name, then you will not be able to refer to it later**.
- You can use a special field-type to indicate that the field is managed by core-code i.e. CORESEPARATOR, CORECALLBACK, COREFORM, COREMENU, and CORETOGGLE.
  You do not need to specify callback functions for core-managed fields.

An alternative is to use the MENU command, followed by the menu's ADD commands and terminated by the EXIT command. The full syntax is shown below:

```
>-- MENU -- gname -+- POPUP --.  .---------<-------.
                   +- MAIN  --| /                  |
                   '----------'-+- NL -+- <fmenu> -|
                                       +- PML -----*
                                       +- EXIT ----.
                                       '-----------'-->
```

Figure 2:37. Syntax Graph -: Defining a Menu

```
                  .-----<-----.
                 /            |
 fmenu>-+- ADD -+- fieldname -|
                +- CORE ------*
                +- SEParator -------------------------------.
                '- dtext -+- rtext -------------------------|
                          +- MENU -- gname -----------------|
                          +- FORM -- fname -----------------|
                          +- CALLback -+- rtext ------------|
                          |            '--------------------|
                          '- TOGgle -+- rtext -.            |
                                     '---------+- SELected -|
                                               '------------'-->
```

Figure 2:38. Syntax Graph -: Using Menu,Add()

2.5.37 Multi Discipline Route Manager

mdrRoutePoint

Name	Returns	Arguments	Description	Remarks
OwningDbBranch	DBREF		Returns owner branch element of this route point.	
OwningRoute	mdrRoute		Returns owning mdrRoute	Redundant? - could be constructed easily from OwningDbBranch
IsEqual	bool	mdrRoutePoint	Returns true if objects are equal	Checks first if the objects could be compared by under lying DB element. If not the position On is used

ExpandToRoute	mdrRoute		Expands external geometry to mdrRoute object.	
IsExternalGeometry	bool		Returns true if its an external geometry object.	
EndingRoutePoint		mdrRoutePoint	Sets end external geometry ending route point.	Valid only if this is a external geometry type route point
EndingRoutePoint	mdrRoute Point		Gets end external geometry ending route point.	Valid only if this is a external geometry type route point
StartingRoutePoint		mdrRoutePoint	Sets end external geometry starting route point.	Valid only if this is a external geometry type route point
StartingRoutePoint	mdrRoute Point		Gets end external geometry starting route point.	Valid only if this is a external geometry type route point
Position	Position		Gets position of the route point in world coordinates.	Valid only if this isn't an external geometry type route point. If there is DB element owned then gets the world position, otherwise its stored as world position inside an object
Position		Position	Sets position of the route point in world coordinates.	Valid only if this isn't an external geometry type route point. If there is DB element owned then sets the local position, converting it before from world coordinates, otherwise sets the world position inside an object
Radius	Real		Get the fillet radius of route point	
Radius		Real	Set the fillet radius of route point	Valid only if this isn't an external geometry type route point. If there is DB element owned then sets the filet radius, otherwise sets the radius inside the object
Clone	mdrRoute Point		Returns cloned object	Clones all the attributes taken from object which from this method is invoked (besides underlying DB element, and name)

Name	String		Gets the name of named route point	
Is That		String type	Returns true if the named types match	Compares if the type is the same with passed as argument.
Type	String		Gets the type of route point object	
Type		String type	Sets the type of route point object	behaviour not specified
DbElement	DBREF		Gets the underlying DB element.	
IsEnabled	bool		Check if element is enables.	
IsNamed			Checks if element is named	
IsOn			true if route point are on the same position	true if route point are on the same position
DbElement		DBREF	Sets owned DB element.	
Enable		bool enabled	Enables or disables route point.	enable true if we want to enable route point otherwise false

mdrRoute

Name	Returns	Arguments	Description	Remarks
dbWrite	bool	DBREF	Writes to DB hierarchy. Argument specify where to method should write to.	Returns true if write was successful
dbUpdate	bool		Updates DB hierarchy.	Returns true if write was successful
clone	mdrRoute		Returns cloned object	Clones all the attributes taken from object which from this method is invoked (besides underlying DB element, and name)
DbElement	DBREF		Gets the underlying DB element.	
DbElement		DBREF	Sets the underlying element.	Method changes ownership
Construct		DBREF	Constructs route point from DB	

Equals	Bool		Checks for equality of elements	
HeadRoutePoint	mdrRoute Point		Gets head route point	
TailRoutePoint	mdrRoute Point		Gets tail route point	
HeadRoutePoint		mdrRoutePoint	Sets head route point	
TailRoutePoint		mdrRoutePoint	Sets tail route point	
InsertRoutePointAt Head		mdrRoutePoint	Inserts route point at head	
InsertRoutePointAtT ail		mdrRoutePoint	Inserts route point at tail	
InsertRoutePoint		mdrRoutePoint	Insert route points at chosen index	
RemoveRoutePoint		mdrRoutePoint	Remove route point from route	
FindRoutePoint		mdrRoutePoint	Gets route index of route point (0 based)	
RoutePoints		Array of mdrRoutePoint	Gets route points	
InsertRouteAtHead		mdrRoute	Merge two routes on head	
InsertRouteAtTail		mdrRoute	Appends route at end	
insert Route		mdrRoute, mdrRoutePoint	Inserts route at route point	
ExpandToRoute			Expands all the ext geom. into route	
ExpandRoutePoint	mdrRoute	mdrRoutePoint	In place expand of ext geom.	
size	real		number of route points in route	
at	mdrRoute Point	real	Route Point at	
SubRoute	mdrRoute	mdrRoutePoint, mdrRoutePoint	Cuts the route between two route points	
HeadSubRoute	mdrRoute	mdrRoutePoint	Creates sub route from head to route point	
TailSubroute	mdrRoute	mdrRoutePoint	Creates sub route from route point to tail	

Transform		Orientation	Transforms route	
Length	Real		Calculates route length	
Length	Real	mdrRoutePoint, mdrRoutePoint	Length between two route points	
Length From	Real		Length from route point	

mdrBaseManager

Name	**Returns**	**Arguments**	**Description**	**Remarks**
CreateRoutePoint	mdrRoute Point	Position	Route point from pos	
CreateRoutePoint	mdrRoute Point	DBREF	Route Point from dbref	
CreateRoutePoint	DBREF		Route from dbref	
FindRoute	Array of mdrConec tionPoint	mdrConnection Graph, mdrRoutePoint, mdrRoutePoint	For given connection graph, and two RoutePoints, find the best path between these route points	
BeginInteractiveRo utePointsEditing		mdrRoute	Enter Route point model editor for given route	
BeginInteractiveQui ckRouting		mdrRoute	Enter Quick Routing model editor for given route	

mdrConnectionManager

Name	**Returns**	**Arguments**	**Description**	**Remarks**
CreateRouteFrom ConnectionPoints	mdrRoute	Array of mdrConnection Points	For given path described by connection points array create route	
CreateConnection GraphFromOwner	mdrConnect ionGraph	DBREF	For given owner, create connection graph	
CreateConnection GraphFromBranc hes	mdrRoute	Array of DBREF	For given array of dbrefs, create a connection graph	

CreateConnectionByGeometryFrombranches		Array of DBREF	Connect list of branches base on their positions	
CreateConnectionsByGeometryFromOwner		DBRF	Connect owning branches element based on their pos	
GetConnectedAttasToAtta	ARRAY of DBREF	DBREF	Connected attas from atta	

mdrConnectionGraph

Name	Returns	Arguments	Description	Remarks
GetConnectionPoint	mdrConnectionPoint	mdrRoutePoint	For given route point return connection point	
GetAllConnectionPoints	Array of mdrConnectionPoints		Get connection point list	

mdrConnectionPoint

Name	Returns	Arguments	Description	Remarks
getRoutePoint	mdrRoute Point		Get route point	
getConnectedRoutePoint	mdrRoute Point		Get connected route point	
getFirstConnectionType	Real		0- head, 1- tail, 2- mid, 3- free, 4- none	
getSecondConnectionType	Real		0- head, 1- tail, 2- mid, 3- free, 4- none	

2.5.38 NUMERICINPUT Object

Members

Member	Type	Purpose
val	REALGet/Set	Value of the numeric input. Gets adjusted to the nearest value in the range.
range	REAL ARRAYGet/Set	Range: Start, End and Step(>0) as reals.

Member	Type	Purpose
ndp	REALReadonly	Integer number of decimal places to be displayed. 0 means integer values.
modifiedEvents	BOOLEANGet/Set	Enable/disable modified events.
editable	BOOLEANGet/Set	Enable/disable editing of the displayed value.

Table 2: 65. NUMERICINPUT Object Members

Methods

Method Name	Result	Purpose
`setRange( !range, !ndp )`	NO RESULT	Set the range and number of decimal places. !range is an array of REAL, defining the min, max and step (>0) values. !NDP<0 leaves the current value unchanged.

Table 2: 66. NUMERICINPUT Object Methods

Command

The NumericInput gadget allows numeric input within a specified range, with given granularity.

The Up/Down arrows control incrementing and decrementing the displayed value by the specified increment, within the range. Additionally it is possible to type in the required value. The number of decimal places can also be specified.

```
                         .-------<-------------------.
                        /                            |
-- NUMERICinput gname -+- <fgtagw> ------------------|
                       +- <fgpos> -------------------|
                       +- <fganch> ------------------|
                       +- <fgdock> ------------------|
                       +- CALLback text -------------|
                       +- TOOLTIP text --------------|
                       +- CORE ----------------------*  Core managed gadget
                       | .-------<-------------------.
                       |/                            |
                       +- RANGE val val -------------|
                       +- STEP val ------------------|
                       +- NDP int -------------------*
                       |
                       +- VALUE val -.
                       '-------------'- <vwid> -+- TOOLTIP text -.
                                                '-------------'-->
```

Notes:

1. The tag text is displayed.
2. Default initial value is the minimum value of the range.
3. The range maximum is adjusted to be an integral number of steps.
4. NDP is the number of decimal places. If NDP is zero then all values will be integer.
5. Typed in values will be adjusted to the nearest valid value in the range.

6. The graph <vwid> allows the gadget width to be set specifically or in terms of other gadgets on the form.
7. It is not possible to provide user formatting of the values displayed by the gadget.

Events and Callbacks

The Numeric input gadget supports SELECT and MODIFIED events, and users may provide a callback method to service these events. Note that often no callback is required, and the numeric input value is merely read and used by other gadgets of the form.

A SELECT event is raised whenever the user presses the ENTER key while the numeric input display field has focus. Typically this happens after the user has typed in a required value, but will also apply if the user enters the field after modifying the values using the up/down arrows. The callback can be a simple or an open callback.

A MODIFIED event is raised for each modification of the displayed value using the up/down arrows. Modified events are only reported if they are enabled and the user has provided a PML open callback, as this allows differentiation from the SELECT events. The default state is modified events disabled.

2.5.39 OBJECT

Method

Name	Result	Purpose
`GetPathName()`	STRING	Extracts the pathname for a file in the PMLLIB searchpath.

Table 2: 67. PML Object Methods

2.5.40 OPTION Gadget

Members

Name	Type	Purpose
`DText`	ARRAY OF STRING Get/Set	Set or get the entire list of display texts.
`DText[n]`	STRING Get Only	Get the display text of the **n**'th option.
`RText`	ARRAY OF STRING Get/Set	Set or get the list of replacement texts.
`RText[n]`	STRING Get Only	Get the replacement text of the **n**'th option.

Name	Type	Purpose
`Count`	REAL Get only	Get count of number of fields in the list.
`Val`	REAL Get/Set	Selected field as integer. Zero implies no selection. Setting **val** to zero will cause an error if ZeroSel is not specified.

Table 2: 68. OPTION Gadget Members

Methods

Name	Result	Purpose
`Add(STRING Dtext)`	NO RESULT	Append an entry to the drop down list, where **Dtext** is the text to display in the option list.
`Add(STRING Dtext, STRING Rtext))`	NO RESULT	Append and entry to the drop down list, where **Dtext** is the text to display in the option list, and **Rtext** is the replacement text for the new field. If **Rtext** isn't specified, it will be set to **Dtext** by default.
`Clear()`	NO RESULT	Clear gadget's contents.
`ClearSelection()`	NO RESULT	Clears selection and returns to default of first in list.
`FullName()`	STRING	Get the full gadget name, e.g.'!!Form.gadget'
`Name()`	STRING	Get the gadget's name, e.g. 'gadget'
`Owner()`	FORM	Get owning form.
`Select(STRING text, STRING value )`	NO RESULT	Select specified item in a list: **text** must be 'Rtext' or 'Dtext', and **value** is the item to be selected.
`Selection()`	STRING	Get current selection's RTEXT.
`Selection(STRING text )`	STRING	Get RTEXT or DTEXT of current selection; **text** must be 'Rtext' or 'Dtext'.
`SetPopup(MENU menu)`	NO RESULT	Links **menu** with the gadget as a popup.

Name	Result	Purpose
`Refresh()`	NOT RESULT	Refreshes the display of the gadget.
`SetFocus()`	NO RESULT	Move keyboard focus to this gadget.
`RemovePopup(MENU menu)`	NO RESULT	Removes (popup) **menu** from the gadget.
`GetPickedPopup()`	MENU	Returns the last picked popup menu for the gadget.
`Shown()`	BOOLEAN	Get 'shown' status.
`Type()`	STRING	Get the gadget type as a string.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..
`DisplayText( )`	STRING	Gets the text string currently displayed in the Option gadget's display field.
`SetPopup(  !menu )`	NO RESULT	Assigns a menu object as the gadget's current popup.
`Clear( !dtext )`	NO RESULT	Delete the field with the given DTEXT string.
`Clear( !fieldNumber )`	NO RESULT	Delete the specified field number.

Table 2: 69. OPTION Gadget Methods

Command

The OPTION command defines an option gadget and specifies the position, tag or pixmap, and callback text of the option (or list button) gadget. Also sets the width allowed for displaying the list options when the gadget is selected.

The arrays defining the display texts and replacement texts for the gadget should be set in the form's default constructor method.

Notes:

1. Option gadget's display text field is non editable, so doesn't need scroll width (syntax is in fact in place for backwards compatibility).

```
                        .-------<-------.
                       /                |
>------ OPTion gname -+- <fgtagw> ------|
                      +- <fgpos> -------|
                      +- <fganch> ------|
                      +- <fgdock> ------|
                      +- CALLback text -|
                      +- TOOLTIP text --|
                      +- NORESELect ----|
                      +- ZEROSELection -|
                      +- CORE ----------*  Core managed gadget
                      |
                      +- PIXmap <vshap> -.
                      '- <vwid> ---------+- TOOLTIP text -.
                                         '----------------'-->
```

Figure 2:39. Syntax Graph -: Setting Up an OPTION Gadget

Reselection of the Selected Field can be Disallowed

There is a new keyword NORESELECT which disables UNSELECT and SELECT events when the currently selected field is re-clicked with the mouse, for example:

option .o1 tagwid $!w |Choose| noResel width 5 tooltip 'select option'

ZeroSelection Property

Option gadgets have a ZeroSelection keyword (similar to that of single choice lists), which allows it to support the notion of no current selection (previously a selection was mandatory).

The syntax has been extended with the optional 'ZEROSELection' keyword, e.g.

option .choose tagWid 3 |Cars| . . . zeroSel noResel width 25 length 10

Behaviour

Note: It is bad practice to place one gadget on top of another. This may lead to gadgets being obscured.

Unselected Events

Option gadgets support UNSELECT events. Typically when a field in the dropdown list is selected, an UNSELECT event is raised for the previously selected field (if any) and then a SELECT event is raised for the new field.

Notes:

1. UNSELECT events are not notified to PML unless an open callback has been specified (so that SELECT and UNSELECT events can be differentiated).
2. Typically the UNSELECT action allows Appware to manage consequences of deselection for any dependent gadgets or forms.
3. We recommend that you do not change the option gadget's selection programmatically in an UNSELECT event.

2.5.41 ORIENTATION Object

Members

Name	**Type**	**Purpose**
`Alpha`	REAL Get/Set	The Alpha component.
`Beta`	REAL Get/Set	The Beta component.
`Gamma`	REAL Get/Set	The Gamma component.
`Origin`	DBREF Get/Set	The DB element which is the origin.

Table 2: 70. ORIENTATION Object Members

Methods

None of these methods modifies the original object.

Name	**Result**	**Purpose**
`Orientation( STRING)`	ORIENTATION	Creates an ORIENTATION from the values given.
`Orientation( STRING, FORMAT )`	ORIENTATION	Creates an ORIENTATION from the values given, in the specified FORMAT.
`EQ(ORIENTATION)`	BOOLEAN	TRUE if ORIENTATIONS are equal.
`LT(ORIENTATION)`	BOOLEAN	TRUE if ORIENTATION is less than argument.
`String(FORMAT)`	STRING	Convert ORIENTATION to a STRING.
`WRT(DBREF)`	ORIENTATION	Convert to a new ORIENTATION with respect to given DB element.
`XDir()`	DIRECTION	Return X component as a DIRECTION.
`YDir()`	DIRECTION	Return Y component as a DIRECTION.
`ZDir()`	DIRECTION	Return Z component as a DIRECTION

Table 2: 71. ORIENTATION Object Methods

2.5.42 PARAGRAPH Gadget

Members

Name	Type	Purpose
`Val`	STRING Get/Set	The paragraph's textual content as a string. If it has a pixmap then the value will be the pathname of the pixmap file as a string.
`Background`	REAL Get/Set	Set or get Background Colour Number.
`Background`	STRING Get/Set	Set Background Colour Name.

Table 2: 72. PARAGPRAPH Object Members

Methods

Name	Result	Purpose

`AddPixmap(STRING)`
`AddPixmap(STRING, STRING)`
`AddPixmap(STRING, STRING, STRING)`
	NO RESULT	Adds pixmaps to be used for the unselected, selected and inactive states.

`FullName()`	STRING	Get the full gadget name, e.g.'!!Form.gadget'.
`Name()`	STRING	Get the gadget's name, e.g. 'gadget'.
`Owner()`	FORM	Get owning form.
`SetPopup (MENU)`	NO RESULT	Links the given menu with the gadget as a popup.
`RemovePopup(MENU)`	NO RESULT	Removes the given popup menu from the gadget.
`GetPickedPopup()`	MENU	Returns the last picked popup menu for the gadget.
`Shown()`	BOOLEAN	Get ‘shown’ status.

Name	Result	Purpose
`Type()`	STRING	Get the GADGET type as a string.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..

Table 2: 73. PARAGPRAPH Object Methods

Command

The PARAGRAPH command defines a paragraph and specifies its position, dimensions (in units of character widths and line heights), and, optionally tag text or a pixmap. Note that a paragraph gadget is passive so it 's callback is never used. A paragraph gadget can have a tag, but it is not displayed.

You can define the PARAGRAPH to be either PML-controlled, or core-code controlled using the gadget qualifier attribute *control type*, with values 'PML" or "CORE".

```
                       .--------------------<------------.
                      /                                  |
>-- PARAgraph gname -+-- <fgpos> ------------------------|
                     +-- BACKGround <colno> -------------|
                     +-- <fganch> -----------------------|
                     +-- <fgdock> -----------------------|
                     +-- CORE ---------------------------
*  Core managed gadget
                     +- PIXMAP -+- filename -.
                     |          '------------'-<vshap>-->
                     '- TEXT text -+-<vshap>-.
                                   '---------'-->
```

Figure 2:40. Syntax Graph -: Setting Up a PARAGRAPH Object

Note:

- If a paragraph is to contain text, then its shape will be specified in grid units. The height is the number of lines of text and the width is typically thought of as the number characters required. This may be less that the actual string length, because the grid width is the size of the font *notional* character width, which is typically smaller than the largest characters in the font. You may need to specify a few extra grid units to guarantee to fit variable strings.
- If a paragraph contains text, and no dimensions are specified, the result is a single line of width (in grid units) equal to the number of text characters. This may not be long enough to guarantee to fit the specific string, so you may nee to pad out with extra spaces to avoid truncation.

- If your paragraph is to contain more than one line of text, you must specify a suitable shape. The text, which can contain newline characters, will be justified in the area given.
- If a pixmap is specified, the shape of the gadget must be defined and will be in pixels. Remember to define the pixmap using the paragraph's `AddPixmap()` method or its .**Val** member.
- If the paragraph is to have its contents modified then the text or pixmap file would normally be specified in the form's default constructor method, rather than in the gadget definition.
  It is bad practice to place one gadget on top of another. This may lead to gadgets being obscured.

2.5.43 PLANE Object

Members

Name	Type	Purpose
`Orientation`	ORIENTATION Get/Set	Orientation of plane.
`Position`	POSITION Get/Set	Origin of plane.

Table 2: 74. PLANE Object Members

Definition Methods

None of these methods modifies the original object.

Name	Result	Purpose
`Plane(POSITION, ORIENTATION)`	PLANE	Creates a PLANE with the given POSITION and ORIENTATION.
`String()`	STRING	Returns the plane as a string.
`Direction(DIRECTION)`	DIRECTION	Z component of the orientation uses standard PDMS method of maintaining X and Y components of the orientation.
`Towards(POSITION)`	NO RESULT	Modifies the direction (Z component of the orientation) member of the plane so it is directed to the position.

Table 2: 75. PLANE Object Definition Methods

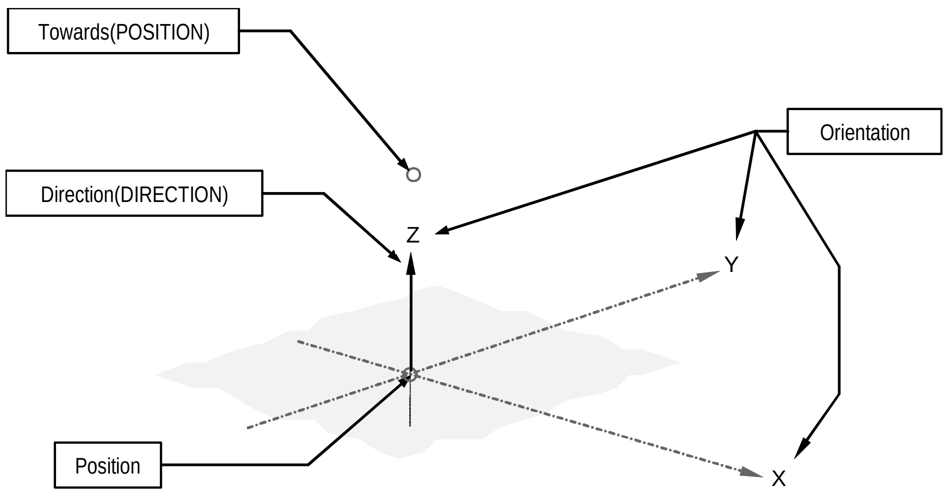


Figure 2:41. PLANE Object Definition

PLANE Object: Methods that Return POSITIONs

Name	Result	Purpose
`Intersection(LINE)`	POSITION	Returns the intersection point of the passed infinite line on the plane definition.
`Intersection(POINT VECTOR)`	POSITION	Returns the intersection point of the passed point vector on the plane definition.
`Intersections(ARC)`	ARRAY OF POSITIONS	Returns the intersection point of the passed arc on the plane definition.
`Intersection(PLANE, PLANE)`	POSITION	Returns intersection position of the three planes.
`PointVector()`	POINT-VECTOR	Returns a point vector at the origin of the plane with a direction equal to the normal of the plane.
`ThreeDPosition(XYPOSITION)`	POSITION	Returns 3D position of the XYPOSITION offset from the plane origin.
`Near(POSITION)`	POSITION	Returns the nearest position on the plane definition of the passed position.

Table 2: 76. PLANE Object Methods that Return POSITIONs

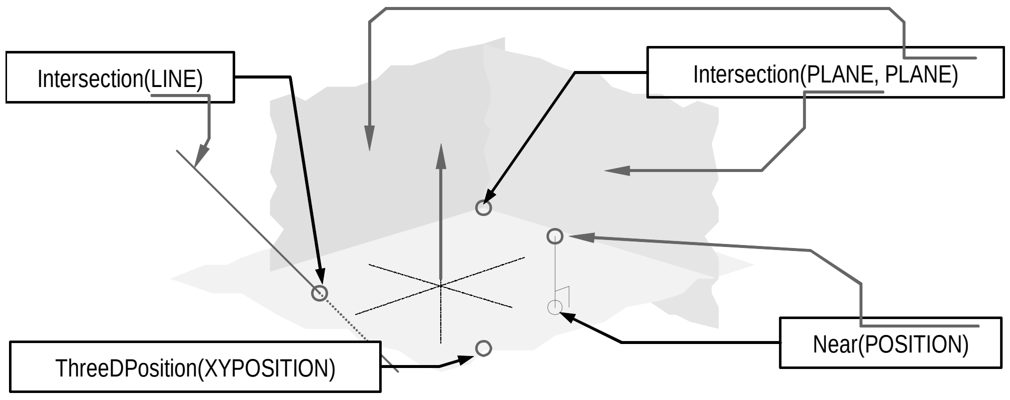


Figure 2:42. POSITIONs returned by PLANE Object Methods

PLANE Object: Methods that Return LINEs

Name	**Result**	**Purpose**
`Line(REAL)`	LINE	Returns a line of the given length in the direction of the plane normal.
`Intersection(PLANE)`	LINE	Returns the intersection line of the passed plane on the plane definition. The start position of the line is the origin of the plane definition projected onto the passed plane. The direction of the line is from the start to the position of the passed plane projected onto the reference plane. If the start and end points are coincident, a line of length 1000mm is returned with the start position being defined as described above.

Table 2: 77. PLANE Object Methods that Return LINEs

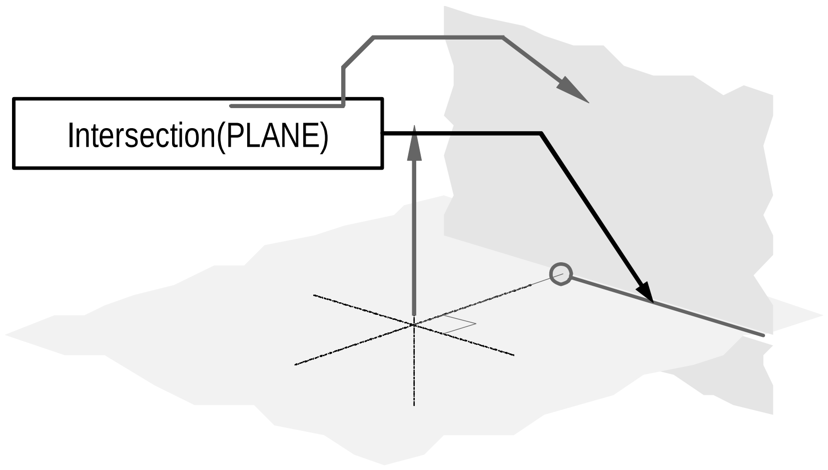


Figure 2:43. LINEs Returned from PLANE Object Methods

PLANE Object: Methods that Return XYOffsets

Name	**Result**	**Purpose**
`XYOffset(Position)`	XYPOSITIO N	Returns the position, mapped onto the plane, in term of an XY offset from the plane origin.

Figure 2:44. PLANE Object Methods that Return XYOffsets

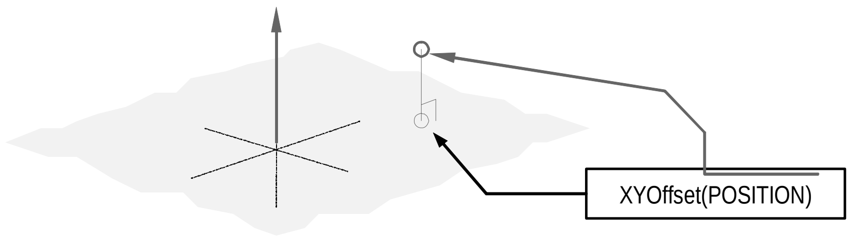


Figure 2:45. XYPositions Returned from PLANE Object Methods

2.5.44 PLANTGRID Object

Members

Name	**Type**	**Purpose**
`Position`	POSITION Get/Set	Origin of the grid.
`Orientation`	ORIENTATION Get/Set	Orientation of the grid.
`XSpacings`	REAL ARRAY Get/Set	Array of spaces in the X direction, each space is relative to the previous.
`YSpacings`	REAL ARRAY Get/Set	Array of spaces in the Y direction, each space is relative to the previous.

Table 2: 78. PLANTGRID Object Members

Methods

None of these methods modifies the original object.

Name	**Result**	**Purpose**
`Plantgrid(POSITION, ORIENTATION, ARRAY, ARRAY )`	PLANTGRID	Creates a grid with the given POSITION and ORIENTATION, and the X and Y spacings specified in the arrays.
`Xsize()`	REAL	Maximum size in the X direction.
`Ysize()`	REAL	Maximum size in the Y direction.
`OutofBounds(POSITION)`	BOOLEAN	Returns whether point lies within the grid boundaries.

Table 2: 79. PLANTGRID Object Methods

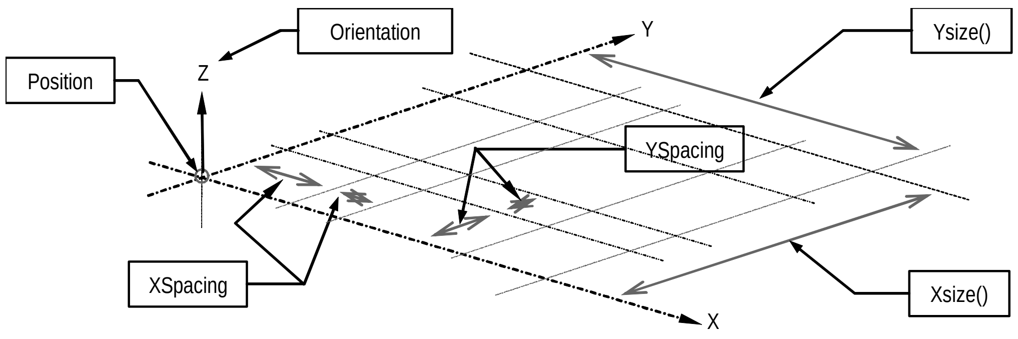


Figure 2:46. Return Values from PLANTGRID Object Methods

2.5.45 PLATFORMGRID

PLATFORMGRID object is used for filling PLTFRM element with certain grid pattern.

Name	Result	Purpose
`ASSIGN(PLATFORMGRID)`	NO RESULT	Copies content of a PLATFORMGRID object into current instance
`GRIDANGLE()`	REAL	Returns the used grid angle value
`GRIDANGLE(REAL)`	NO RESULT	Sets grid angle value
`GRIDPOINT(REAL1, REAL2)`	NO RESULT	Returns position of the intersection of gridlines: X (identified by given index - REAL1) and Y (identified by given index -REAL2)
`GRIDPOSITION()`	POSITION	Returns the grid's origin
`GRIDXSPACINGS()`	ARRAY	Returns the grid's spacing pattern along X axe
`GRIDXSPACINGS(ARRAY)`	NO RESULT	Sets the grid's spacing pattern along X axe
`GRIDXYPOSITION()`	XYPOSITION	Returns position of grid's origin
`GRIDXYPOSITION(XYPOSITION)`	NO RESULT	Sets the position of grid
`GRIDXYSIZE()`	REAL ARRAY	Returns the size of rectangle which contains the grid
`GRIDYSPACINGS()`	REAL ARRAY	Returns the grid's spacing pattern along Y axe
`GRIDYSPACINGS(ARRAY)`	NO RESULT	Sets the grid's spacing pattern along Y axe

`GROSSAREA()`	REAL	Returns the gross area of the grid
`NETAREA()`	REAL	Returns the net area of the grid
`ORIENTATION()`	ORIENTATION	Returns the platform's orientation
`ORIENTATION(ORIENTATION)`	NO RESULT	Sets the platform's orientation for given value
`PLANE()`	PLANE	Return the plane definition of platform grid. This is equivalent of PLANE method on PROFILE object
`PLATFORMGRID()`	PLATFORMGRID	Create a platformgrid object.
`PLATFORMGRID(DBREF)`	PLATFORMGRID	Creates a platformgrid from DBREF. DBREF must be PLTGRD or INTFRM element. The outer boundary is created from owning PLTFRM routing path (RPATH). Inner boundaries are created from PLOPEN elements
`POSITION()`	POSITION	Returns position of the platform
`POSITION(POSITION)`	NO RESULT	Sets the grid's position
`XYSIZE()`	ARRAY	Returns the size of rectangle (limits) which contains the grid in platform coordinate system

Methods that are performing operations on grid boundaries

Name	**Result**	**Purpose**
`ADDINNERBOUNDARY(PROFILE)`	NO RESULT	Adds new inner boundary to the grid
`CLEARINNERBOUNDARY()`	NO RESULT	Deletes all inner boundaries
`INNERBOUNDARIES()`	PROFILE ARRAY	Returns array of inner boundaries profiles
`INNERBOUNDARIES(ARRAY)`	NO RESULT	Replaces the inner boundaries

`INNERBOUNDARY(REAL)`	PROFILE	Returns the profile of the inner boundary
`NUMBEROFINNERBOUNDARIES()`	REAL	Returns the number of grid's inner boundaries
`OUTERBOUNDARY()`	PROFILE	Returns the outer boundary profile

Methods that return information about grids cells

Each cell is identified by index of two REAL.

Name	Result	Purpose
`CELLORIENTATION(REAL1, REAL2)`	ORIENTATION	Returns an orientation of cell identified by given index.
`CELLPOSITION(REAL1, REAL2)`	POSITION	Returns a position of cell identified by given index
`CELLPROFILE(REAL1, REAL2)`	PROFILE	Returns a profile of cell identified by given index
`CELLSIZE(REAL1, REAL2)`	REAL ARRAY	Returns the size of cell identified by given index (before trimming)
`CELLXYPOSITION(REAL1, REAL2)`	POSITION	Returns position of the cell identified by given index
`ISCELLTRIMMED(REAL1, REAL2)`	BOOL	Returns true if cell is trimmed
`ISCELLUNTRIMMED(REAL1, REAL2)`	BOOL	Returns true if cell is untrimmed
`ISCELLWITHIN(REAL1, REAL2)`	BOOL	Returns true if cell is within grid
`LISTOFTRIMMEDCELLS()`	ARRAY	Returns indices of all trimmed cells
`LISTOFTRIMMEDCELLS(REAL)`	ARRAY	Returns indices of all trimmed cells which area is greater than given REAL value
`LISTOFUNTRIMMEDCELLS()`	ARRAY	Returns indices of all untrimmed cells
`TOTALNUMBEROFCELLS()`	REAL	Returns a number of cells inside grid
`TRIMMEDCELLSIZE(REAL1, REAL2)`	ARRAY	Returns the size of rectangle which contains the cell identified by given index

Methods that return information of gridlines

Lines are returned as ARRAY which first element is REAL representing line number and the second is array of LINE objects.

Name	Result	Purpose
`XGRIDLINES()`	ARRAY	Returns array of grid's x-lines
`XGRIDLINES(REAL)`	ARRAY	Returns array of grid's x-lines of given index
`YGRIDLINES()`	ARRAY	Returns array of grid's y-lines
`YGRIDLINES(REAL)`	ARRAY	Returns array of grid's y-lines of given index

2.5.46 PMLSECURELOGIN

PMLSECURELOGIN object is used to control the encrypted command script generation functionality.

Methods

Name	Result	Purpose
`PMLSecureLogin( )`	PMLSECURELOGIN	Construct an instance of this object
`EmbedMacro(BOOLEAN)`	NO RESULT	Embed the specified macro
`HasLicenceToEmbedMacro( )`	BOOLEAN	Returns TRUE if EmbedMacro functionality is available.
`Macro(STRING)`	NO RESULT	Set the macro to run where STRING specifies the full path of the macro
`MDB(STRING)`	NO RESULT	Sets the login MDB
`Password(STRING)`	NO RESULT	Sets the login password
`Project(STRING)`	NO RESULT	Sets the login project
`SaveToFile(STRING)`	NO RESULT	Encrypt and save to specified path
`User(STRING)`	NO RESULT	Sets the login user
`VerifyAfter(DATETIME)`	NO RESULT	Verify after specified date
`VerifyBefore(DATETIME)`	NO RESULT	Verify before specified date
`VerifyHostnames(ARRAY)`	NO RESULT	Verify a number of host names specified as an array of strings
`VerifyWinusers(ARRAY)`	NO RESULT	Verify a number of windows users specified as an array of strings

Table 2: 80. PMLSECURELOGIN Object Method

2.5.47 PMLUSERLOGIN

PMLUSERLOGIN object allows generation of a project entry script only for the currently logged-in user which means that it does not require entry of username and password.

Methods

Name	Result	Purpose
`PMLUserLogin( )`	PMLUSERLOGIN	Construct an instance of this object
`Macro(STRING)`	NO RESULT	Set the macro to run where STRING specifies the full path of the macro
`MDB(STRING)`	NO RESULT	Sets the login MDB
`Project(STRING)`	NO RESULT	Sets the login project
`SaveToFile(STRING)`	NO RESULT	Encrypt and save to specified path
`VerifyNonInteractive(BOOLEAN)`	NO RESULT	If TRUE is passed, verify that no user interaction occurs after execution of the generated macro

Table 2: 81. PMLUSERLOGIN Object Methods

2.5.48 POINTVECTOR Object

Members

Name	Type	Purpose
`Direction`	DIRECTION Get/Set	Direction of point
`Position`	POSITION Get/Set	Origin of point

Table 2: 82. POINTVECTOR Object Members

Definition Methods

Name	Result	Purpose
`Pointvector( POSITION, DIRECTION)`	POINTVECTOR	Creates a POINTVECTOR with the given POSITION and DIRECTION
`String()`	STRING	Returns a POINTVECTOR as a string.

Figure 2:47. POINTVECTOR Object Methods

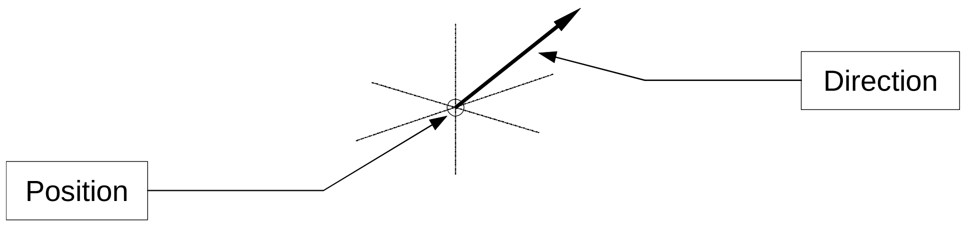


Figure 2:48. POINTVECTOR Object Definition

Methods that Return POINTVECTORs

Name	Result	Purpose
`Offset(REAL)`	POINTVECTOR	Returns the point vector offset in its direction by the passed distance
`Towards(POSITION)`	POINTVECTOR	Returns the point vector with the original position and the direction constructed from the position directed to the passed position
`Through(POSITION)`	POINTVECTOR	Returns the point vector at the intersection of the point line with a plane normal to the point line through the passed position

Table 2: 83. POINTVECTOR Object Methods that Return POINTVECTORs

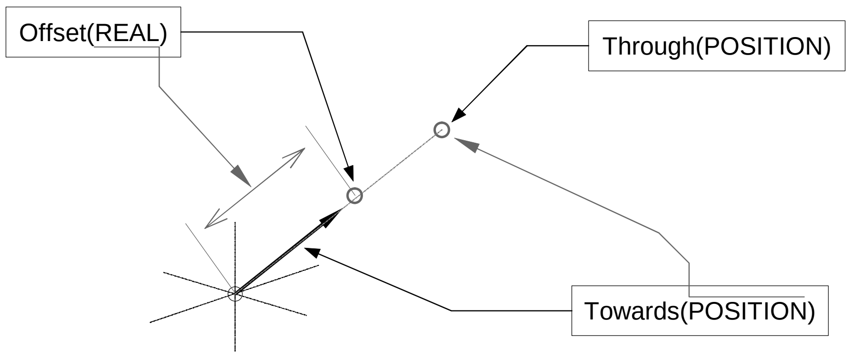


Figure 2:49. POINTVECTORs Returned from POINTVECTOR Object Methods

Methods that Return POSITIONs

Name	Result	Purpose
`Intersection(POINTVECTOR)`	POSITION	Returns the intersection position of the point vectors.
`Intersection(LINE)`	POSITION	Returns the intersection position of the point vector with the supplied line.
`Intersection(PLANE)`	POSITION	Returns the position at the intersection of the point vector with the supplied plane

Table 2: 84. POINTVECTOR Object Methods that Return POSITIONs

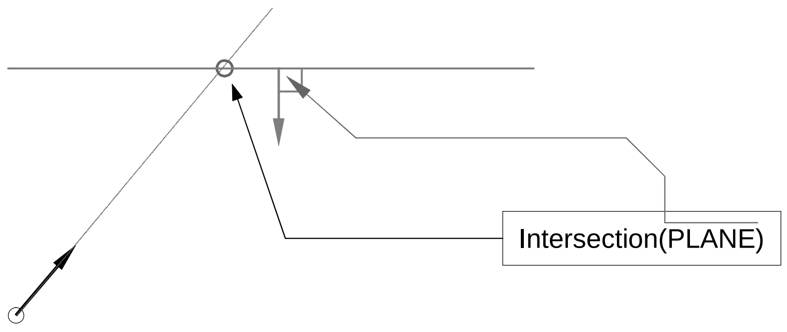


Figure 2:50. POINTVECTOR Intersection with a PLANE

Miscellaneous Methods

Name	Result	Purpose
`Intersections(ARC)`	ARRAY OF POSITIONS	Returns the positions at the intersection of the point vector with the supplied arc.
`Plane()`	PLANE	Returns a plane with an origin equal to the position of the point vector and a normal direction equal to the point vector direction.
`Line(REAL)`	LINE	Returns a line with a start position equal to the position of the point vector, a direction equal to the direction of the point vector and a length equal to the supplied length.

Table 2: 85. POINTVECTOR Object Miscellaneous Methods

2.5.49 POSITION Object

Members

Name	Type	Purpose
`East`	REAL Get/Set	The East component
`North`	REAL Get/Set	The North component
`Up`	REAL Get/Set	The Up component
`Origin`	DBREF Get/Set	The DB element that is the origin

Table 2: 86. POSITION Object Members

Methods

Name	Result	Purpose
`Position(STRING )`	POSITION	Creates a POSITION at the coordinates given in STRING.
`Position(STRING, FORMAT)`	POSITION	Creates a POSITION at the coordinates given in STRING, with the specified FORMAT.
`Component(DIRECTION)`	REAL	Magnitude of component in specified DIRECTION.
`EQ(POSITION)`	BOOLEAN	TRUE if POSITIONS are the same.
`LT(POSITION)`	BOOLEAN	TRUE if POSITION is less than argument.
`String(FORMAT)`	STRING	Convert POSITION to a STRING.
`WRT(DBREF)`	POSITION	Convert to a new POSITION with respect to given DB element.
`Angle (POSITION, POSITION)`	REAL	Returns the angle between the passed two points about the position object.
`ArcCentre(POSITION, POSITION, POSITION, DIRECTION, REAL )`	ARC	Returns an arc using arc centre technique. The direction is the ‘normal viewing’ direction.
`ArcCentre(POSITION, POSITION, POSITION, DIRECTION, REAL)`	ARC	Returns an arc using arc centre technique. The direction is the ‘normal viewing’ direction. Please see diagram for full explanation.

Table 2: 87. POSITION Object Methods (a)

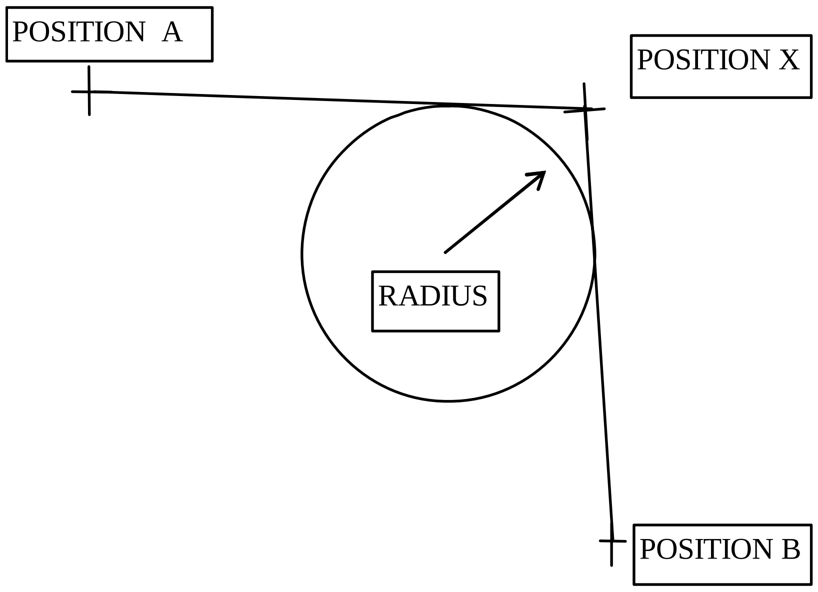


Figure 2:51. !Arc = !posX.ArcFillet(!posA,!posB,!dir,!radius)

Name	Result	Purpose
`ArcFillet( POSITION, POSITION, DIRECTION, REAL )`	ARC	Returns an arc using arc centre technique. The direction is the ‘normal viewing’ direction. Please see diagram for full explanation.
`ArcRadius( POSITION, POSITION, DIRECTION, REAL, BOOLEAN )`	ARC	Returns an arc using arc radius technique. The direction is the ‘normal viewing’ direction. The boolean selects the minor (FALSE) or major(TRUE) arc. Please see diagram for full explanation.

Table 2: 88. POSITION Object Methods (b)

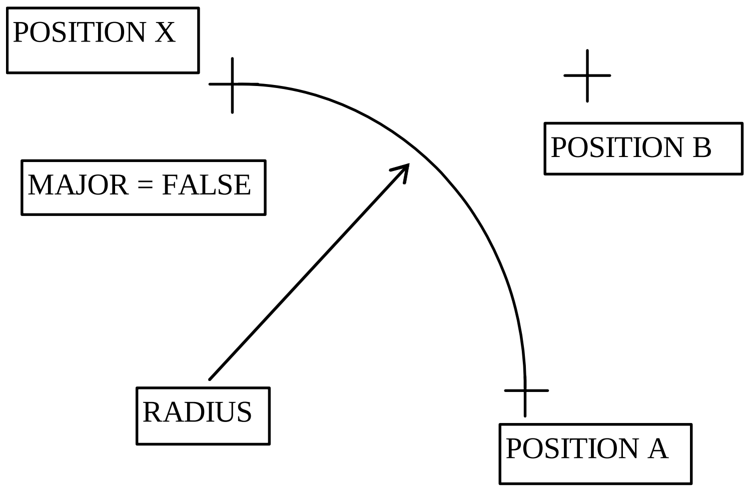


Figure 2:52. !Arc = !posX.ArcRadius(!posA,!posB,!dir,radius,!major)

Name	**Result**	**Purpose**
`ArcThru( POSITION, POSITION, DIRECTION )`	ARC	Returns an arc using arc through 3 points technique. The direction is the 'normal viewing' direction. Please see diagram for full explanation.

Table 2: 89. POSITION Object Methods (c)

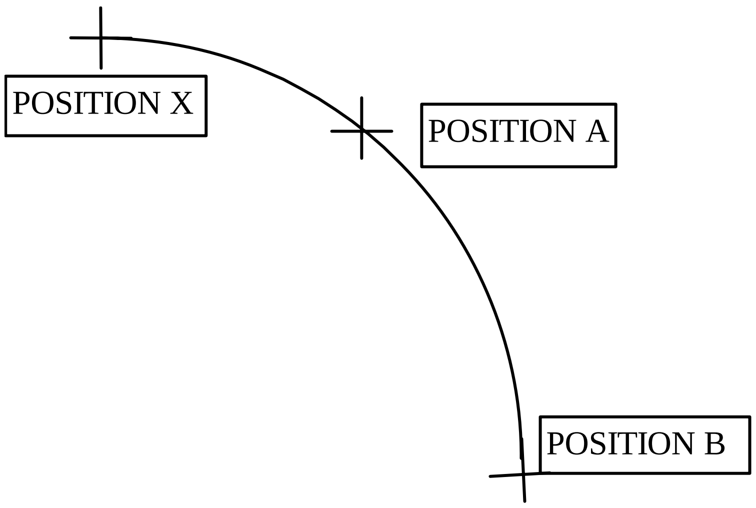


Figure 2:53. !Arc = !posX.ArcThru(!posA,!posB,!dir)

Name	Result	Purpose
`ArcThru( POSITION, POSITION, DIRECTION, REAL )`	ARC	Returns an arc using arc through 3 points and radius technique. The direction is the ‘normal viewing’ direction. Please see diagram for full explanation.

Table 2: 90. POSITION Object Methods (d)

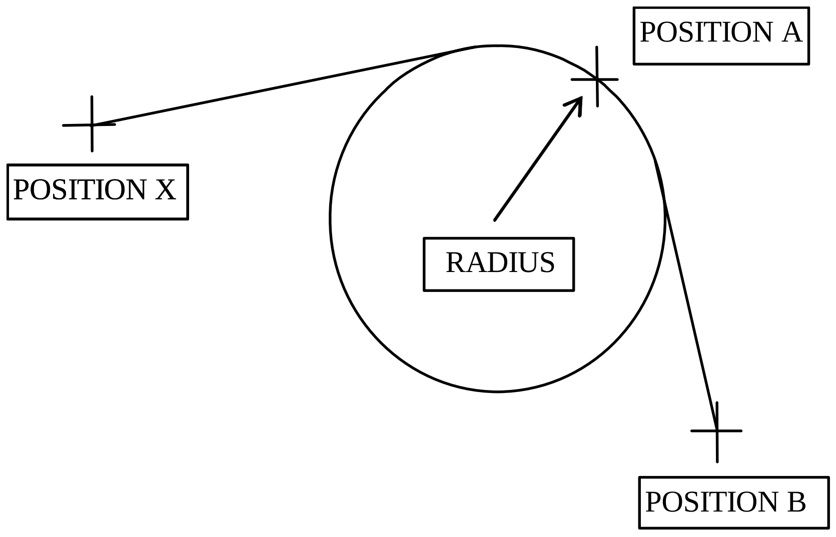


Figure 2:54. !Arc = !posX.ArcThru(!posA,!posB,!dir,!radius)

Name	Result	Purpose
`Arc3Lines( LINE, LINE, LINE, DIRECTION )`	ARC	Returns a circle through the 3 line tangent points. The 'this' position refers to the zone in which the circle lies.
`Direction(POSITION)`	BOOLEAN	Returns the direction between the position and the supplied position
`Distance(ARC)`	REAL	Returns the distance between the position and the nearest point on the arc line of the passed arc definition
`MidPoint(POSITION)`	POSITION	Returns the mid point between the two positions

Name	Result	Purpose
`Near(POSITION, REAL)`	BOOLEAN	Returns true if the passed position is within the passed distance from the position object
`Offset(DIRECTION, REAL)`	POSITION	Returns a position offset by the supplied length in the supplied direction
`Plane(POSITION, POSITION)`	PLANE	Returns a plane in which each of the supplied points lie.
`Distance(LINE)`	REAL	Returns the distance between the position and the nearest point on the passed infinite line definition
`Distance(PLANE)`	REAL	Returns the distance between the position and the nearest point on the passed plane definition
`Distance(POSITION)`	REAL	Returns the distance between the two positions
`Line(POSITION)`	LINE	Returns a line between the two positions, starting at the position object
`MidPoint(POSITION)`	POSITION	Returns the mid point between the two positions
`Near(POSITION, REAL)`	BOOLEAN	Returns true if the passed position is within the passed distance from the position object
`Offset(DIRECTION, REAL)`	POSITION	Returns a position offset by the supplied length in the supplied direction
`Plane(POSITION, POSITION)`	PLANE	Returns a plane in which each of the supplied points lie.

Table 2: 91. POSITION Object Methods (e)

2.5.50 POSTEVENTS Object

The user may provide a **PostEvents** object, which should provide the methods described below.

To use this feature, you must create a global object of this type and call it **!!postEvents**.

The method `!!postEvents.postMark` will be called every time an undoable is created, after the undoable has been added to the undo stack.

This refers to all undoables, whether created by a MARKDB command, an undoable object or within core functionality.

Similarly, the method `postUndo` will be called after an UNDO has occurred, and so on. Each method will be passed a STRING object containing the name of the mark with which the mark, undo, or redo is associated.

Methods

Name	Result	Purpose
`postMark(STRING)`	NO RESULT	Called after an undoable has been added to the undo stack. STRING is the description text associated with the undoable object.
`postUndo (STRING)`	NO RESULT	Called after an undo has occurred. STRING is the description text associated with the undoable object.
`postRedo(STRING)`	NO RESULT	Called after a redo has occurred. STRING is the description text associated with the undoable object.
`postClearMark()`	NO RESULT	Called after a `clearMark` has occurred
`postClearAll()`	NO RESULT	Called after a `clearAll` has occurred.

Table 2: 92. PML PostEvents Object Methods

2.5.51 PROJECT Object

Members

Name	Type	Purpose
`Name`	STRING	The name of the Project, up to 120 characters.
`Evar`	STRING	Project environment variable, e.g. SAM000

Table 2: 93. PROJECT Object Members

Methods

Name	Result	Purpose
`Active()`	REAL	Number of active users of the project
`Code()`	STRING	Project code, three characters, e.g. SAM
`Description()`	STRING	Project description, up to 120 characters.
`Mbcharset()`	STRING	Multibyte character set number
`Message()`	STRING	Project message (information about the project), up to 120 characters.
`Name()`	STRING	Project name
`Number()`	STRING	Project number, up to 17 characters.
`Isglobal()`	BOOLEAN	Whether project is a global project.
`Locations()`	ARRAY OF LOCATION	Return array of all Locations in Project
`CurrentLocation()`	LOCATION	Return true current location
`Sessions()`	ARRAY OF SESSIONS	Return array of all Sessions (at the current location)
`CurrentSession()`	SESSION	Return current Session (at the current location)
`Dblist()`	ARRAY OF DB OBJECTS	List of databases in the project.
`MDBList()`	ARRAY OF MDBS	Return array of all MDBs in Project at current location.
`UserList()`	ARRAY OF USERS	Return array of all USERs in Project at current location.
`Macros()`	ARRAY OF MACROS	Return array of all Inter-db macros in MISC db in Project at current location.
`Messages()`	ARRAY OF STRINGS	Return array of all messages in MISC db at current location.

Table 2: 94. PROJECT Object Methods

Commands

`!ARRAY = PROJECTS`	$ Returns an array of all PROJECT objects $ which have project environment variables set.
`!PROJECTVAR = CURRENT PROJECT`	$ Returns the current project object.

2.5.52 PROFILE Object

Members

Name	Type	Purpose
`Position`	POSITION Get/Set	Origin of profile
`Orientation`	ORIENTATION Get/Set	Orientation of profile plane
`Pointer`	POINTER Get Only	Definition of profile

Table 2: 95. PROFILE Object Members

Methods

Name	Result	Purpose
`Profile(POSITION, ORIENTATION, ARRAY)`	PROFILE	Creates a profile object. The input ARRAY is an array of LINEs, ARCs and POSITIONs. Other array member types will be ignored. Array member must be initialised correctly, otherwise it will be ignored.
`Profile(DBREF)`	PROFILE	Creates a profile object from a LOOP, PLOO, PALJ or SPINE. Approximately from a POGO, BOUN, DRAW. 3D linear geometry (SPINE,BOUN, DRAW,PALJ) should be in a single plane. If not it is projected onto a plane defined by the first few points of the element.

Name	Result	Purpose
`Profile(DBREF1,DBREF2)`	PROFILE	Creates a profile object from SPRO or SLOO at DBREF1. DBREF2 is the design element referencing the catalogue element containing the catalogue primitive thus providing its parameters.
`Profile(PROFILE)`	PROFILE	Creates a profile object which is a copy of the given profile
`Plane()`	PLANE	Returns the PLANE definition of the profile. This is equivalent to the PLANE method on LINEARGRID object
`IsClosed()`	BOOLEAN	Return true if closed
`IsValidClosed ()`	BOOLEAN	Returns true if the profile is valid and could be drawn correctly using GML, e.g. there are no self-intersecting edges
`Sense()`	BOOLEAN	True if anti-clockwise (on its plane). Returns error if profile is not closed
`Area()`	REAL	Internal area of profile. Returns error if profile is not closed
`Length()`	REAL	Returns the complete length of the profile.
`IsCircle()`	BOOLEAN	Returns true if profile is a full circle.
`IsFillet(REAL)`	BOOLEAN	Returns true if edge specified by REAL argument is a fillet. A fillet must be an arc with a significant angle that is tangentially continuous with its adjacent edges that are lines, or arcs of larger radius.

Table 2: 96. PROFILE Object Methods

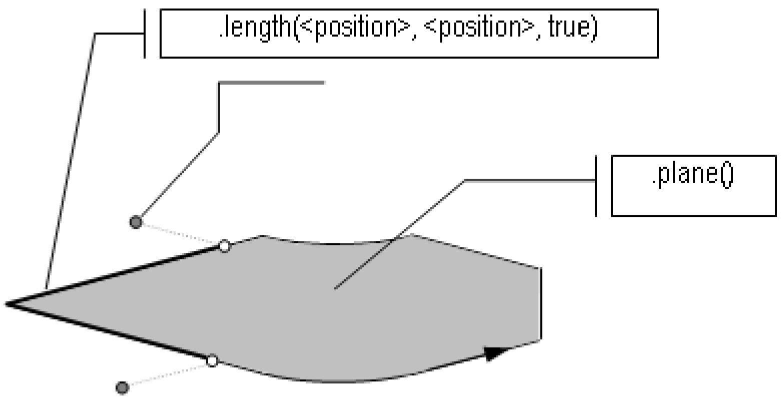


Figure 2:55. Finding the Length of the PROFILE Object

PROFILE Object Decomposition and Display Methods

Name	Result	Purpose
`edges()`	ARRAY	Returns array of lines and arcs that define the profile. The direction and sense of the lines and arcs are important. If the profile is a full circle only a single full circle arc is returned regardless of the composition of the profile.
`numberEdges()`	REAL	Returns the number of edges within the profile (= vertices-1)
`edge(REAL)`	LINE/ARC	Returns the profile element at the passed index of the edges array
`dbWrite(DBREF)`	PROFILE	Populates DBREF with contents of the profile. If any geometry already exists it is replaced with the profile geometry. The geometry stored is that which is appropriate to the database element. The DBREF must be one of LOOP, PLOO, PALJ, SPINE, BOUN, DRAW, POGO. Returns itself unmodified.

Name	Result	Purpose
		The owner of a LOOP or PLOOP is repositioned to fit with the profile. Other geometry is positioned correctly in the frame of reference of its owner or positioned ancestor. Population of catalogue geometry is not supported
`draw(REAL1, REAL2, REAL3)`	PROFILE	Draws the profile as a set of aid lines and arcs. REAL1 is the Segment number to draw to. REAL2 sets the style of the segment. REAL3 sets the colour of the segment.. The drawn graphics can be queried and manipulated using AID geometry functions. LINE and ARC objects also have the .draw method implemented

Table 2: 97. PROFILE Object Decomposition and Display Methods

PROFILE Object Transformations and Modification Methods

These methods return a modified version of the profile definition:

Name	Result	Purpose
`mirror(LINE)`	PROFILE	Mirrors the boundary definition about the passed line, when mapped onto the boundary plane
`translate(REAL1,REAL2)`	PROFILE	Offsets the boundary definition in the XY of the boundary plane with a shift of x of REAL1 and y of REAL2
`rotate(REAL, POSITION)`	PROFILE	Rotates the boundary definition about the POSITION by the given angle. Angle are anti-clock-wise about the Z axes of the boundary plane
`close()`	PROFILE	Closes the profile with an additional edge (if necessary). If ends are within a tolerance the end point is adjusted
`reverse()`	PROFILE	Reverses the sense of the profile and the order of the edges

Name	Result	Purpose
`mergearcs(REAL1, REAL2)`	PROFILE	Merge concentric contiguous arcs into one up to a maximum arc angle of REAL1 degrees according to tolerance REAL2 `Mergearcs()` will remove concentric back tracks in the profile as well.
`mergearcs()`	PROFILE	Merge concentric contiguous arcs into one.
`mergelines(REAL)`	PROFILE	Merge colinear contiguous lines into one according to tolerance supplied. `Mergelines()` will remove colinear backtracks in the profile as well.
`mergelines()`	PROFILE	Merge colinear contiguous lines into one.
`mergpoints(REAL)`	PROFILE	Remove coincident consecutive points according to tolerance supplied
`mergepoints()`	PROFILE	Remove coincident consecutive points
`polyline(REAL)`	PROFILE	Replace arcs with a chordal approximation to the tolerance supplied
`polyline()`	PROFILE	Replace arcs with a chordal approximation
`projectArcs(REAL)`	PROFILE	Removes all the arcs from the definition, only leaving the straight-line edges. Arcs with angle less than the supplied argument are ignored. Arcs that are removed are replaced by projected tangents meeting at the polar position of the arc. Arcs with angles approaching 180 degrees are split in half

Table 2: 98. PROFILE Object Transformations and Modification Methods

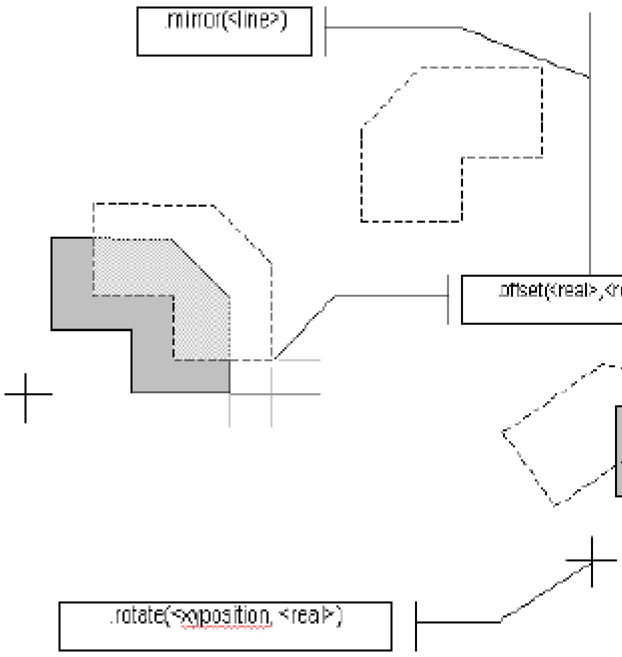


Figure 2:56. Transformations and Modifications by PROFILE Object Methods

PROFILE Object Methods that Query Position Relationships

These methods map the passed positions onto the profile plane, then use the resulting position to determine the result returned:

Name	Result	Purpose
`Near(POSITION)`	POSITION	Returns the nearest position on the profile, to the given position projected onto the profile plane.
`Near(REAL,POSITION)`	POSITION	The REAL argument is an index to an edge in the Profile. Returns the nearest point on this edge to the POSITION supplied. This is the same as `.near (POSITION)` but restricted to a single edge.
`NearEdges(POSITION)`	ARRAY	Returns array of edge indices of the nearest edges to the given POSITION. The returned edges may be any in the profile. Edges will be consecutive if nearest point is a vertex.

Name	Result	Purpose
`IsWithin(POSITION)`	BOOLEAN	Returns TRUE if the position when mapped on to the profile plane lies inside the profile. The profile must be closed.
`IsWithout(POSITION)`	BOOLEAN	Returns TRUE if the position when mapped on to the profile plane lies outside the profile. The profile must be closed.
`OnProfile(POSITION)`	BOOLEAN	Returns TRUE if the position (mapped onto the profile plane) lies on the profile geometry.

Table 2: 99. Profile Object Methods that Query Position Relationships

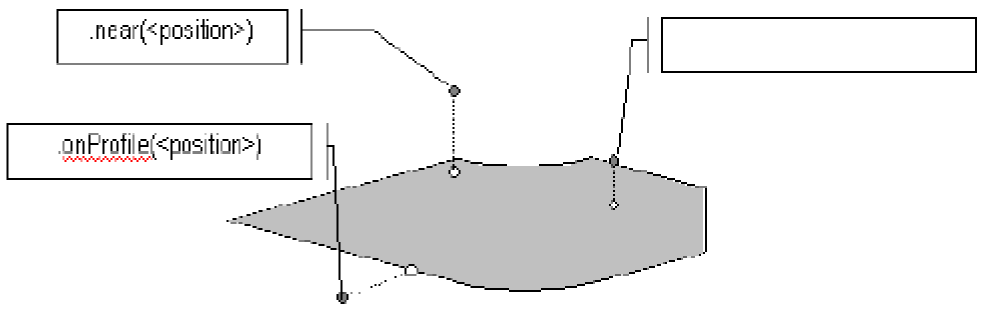


Figure 2:57. POSITION Relationships for PROFILE Objects

PROFILE Object Methods that Query Profile to Profile Relationships

These methods are used to check the relationship between PROFILEs.

Name	Result	Purpose
`IsWithin(PROFILE)`	BOOLEAN	True if the supplied profile lies wholly within the profile the object. Both profiles must be closed.
`IsWithout(PROFILE)`	BOOLEAN	True if the supplied profile lies completely outside the profile object. Both profiles must be closed.
`IsIntersecting(PROFILE)`	BOOLEAN	True if the supplied profile intersects the profile object. Both profiles must be closed

Table 2: 100. PROFILE Object Methods that Query Profile to Profile Relationships

PROFILE Object Intersection Methods

These methods return an array of results that define the intersection between an object and the profile. Note that if an intersection point occurs exactly at the junction of two spans of the profile, then two identical intersection points will occur in the array.

Name	Result	Purpose
`intersections(LINE)`	ARRAY OF POINTS	Returns an array of points that are positions where the line (or the projection of the line into the plane of the profile) intersects the profile. All points on the extended infinite line are returned.
`intersections(ARC)`	ARRAY OF POINTS	Returns an array of points that are positions where the arc (or the projection of the arc into the plane of the profile) intersects the profile. The plane of the arc must be parallel with the plane of the profile otherwise an error will occur. The points are anywhere on the circle of the arc (and not limited to be between start and end)
`intersections(PROFILE)`	ARRAY OF POINTS	Returns an array of points which are positions where the two profiles intersect.. The two profiles must be parallel (or anti-parallel) to each other

Table 2: 101. PROFILE Intersection Methods

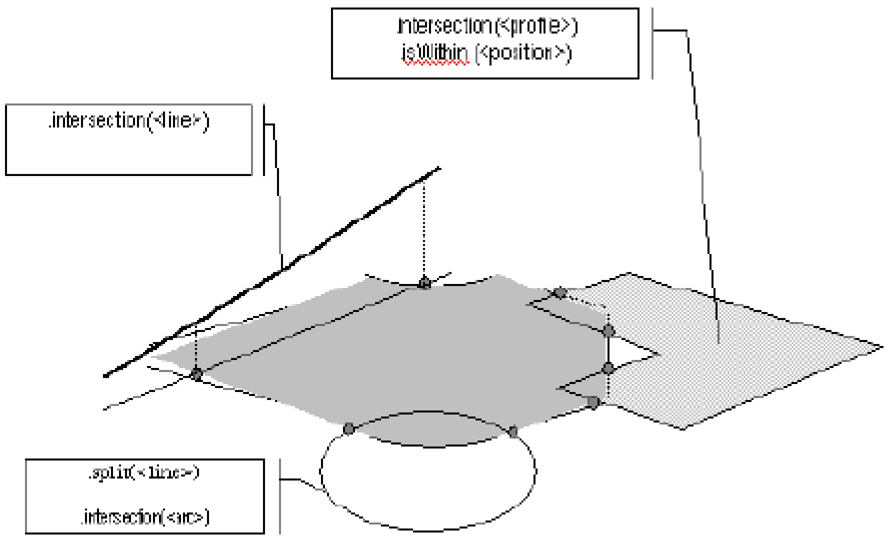


Figure 2:58. Intersections of PROFILE Objects

PROFILE Object Methods that Return New PROFILEs

These methods each return an array of new profiles. The new profiles are all created in he same sense as the profile object, except that 'holes' are in the opposite sense. The profiles must lie on the same plane in space, but not necessarily having identical positions and orientations.

Name	Result	Purpose
`intersect(PROFILE)`	ARRAY OF PROFILES	Returns array of the resultant intersection profiles
`union(PROFILE)`	ARRAY OF PROFILES	Returns the union of the two profiles. Holes are returned as separate profiles (in reverse direction)
`difference(PROFILE)`	ARRAY OF PROFILES	Returns the difference of the passed profile against the profile definition
`split(LINE)`	ARRAY OF PROFILES	Returns the resultant profiles from projecting the passed line onto the profile and splitting about that line
`split(PLANE, BOOLEAN)`	ARRAY OF PROFILES	Returns the resultant boundaries from splitting the profile on the line at the intersection of the passed plane and the profile plane. The side is specified by the supplied BOOLEAN. If it is TRUE then only profiles in the direction of the normal to the passed plane are created; if side is FALSE, only those in the direction of the anti-normal.

Table 2: 102. PROFILE Object Methods that Return New PROFILEs

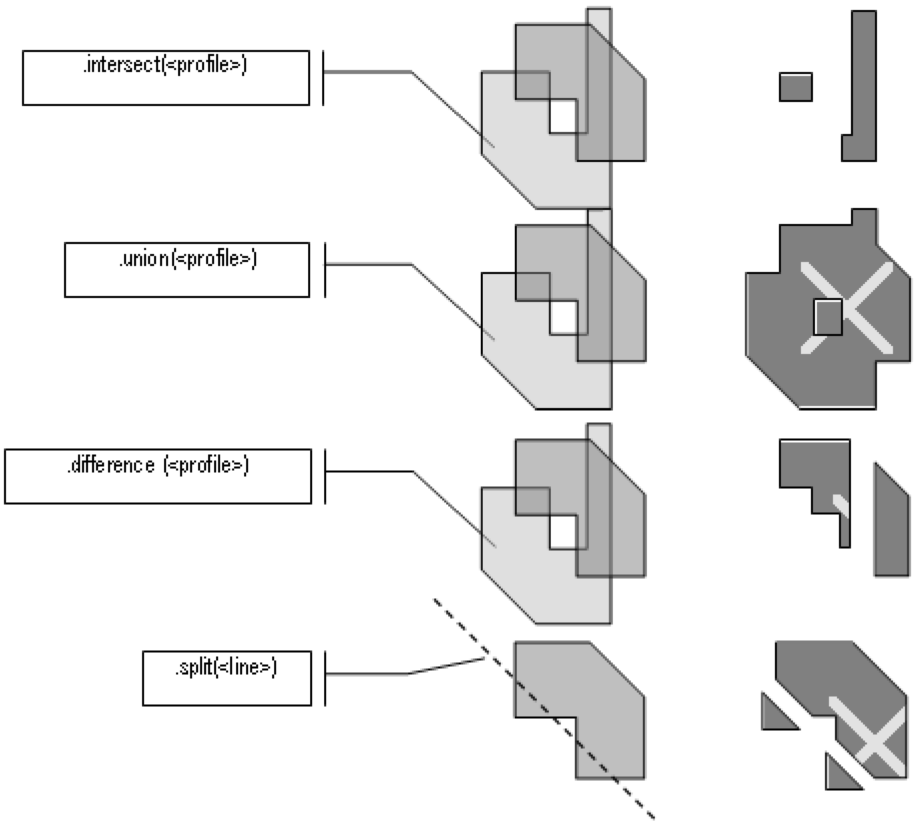


Figure 2:59. PROFILEs Returned from PROFILE Object Methods

2.5.53 RADIALGRID Object

RADIAL GRID Object Members

Name	Type	Purpose
`Position`	POSITION Get/Set	Origin of the grid.
`Orientation`	ORIENTATION Get/Set	Orientation of the grid.
`Radii`	REAL ARRAY Get/Set	Radii of the grid.
`Angles`	REAL ARRAY Get/Set	Angular spacing, from X axes (zero).

Figure 2:60. RADIALGRID Object Members

RADIALGRID Object Definition Methods

Name	Result	Purpose
`Radialgrid( POSITION, ORIENTATION, ARRAY, ARRAY)`	RADIALGRID	Creates a grid with the given position and orientation, and the angles and radii specified in the arrays.

Table 2: 103. RADIALGRID Object Definition Methods

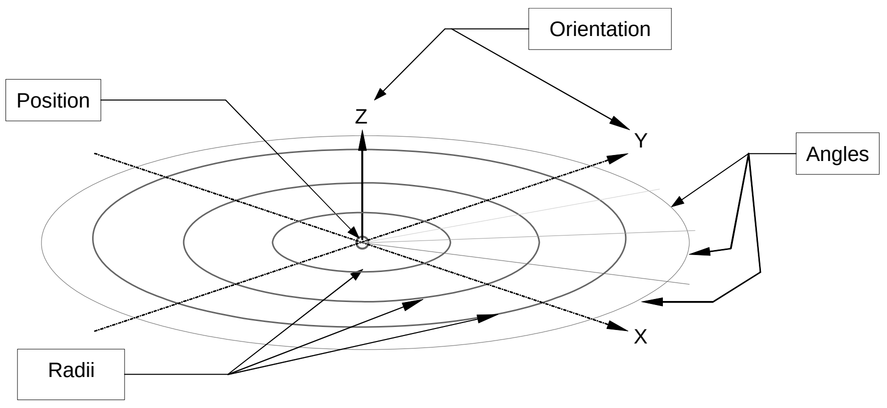


Figure 2:61. RADIALGRID Object definition (a)

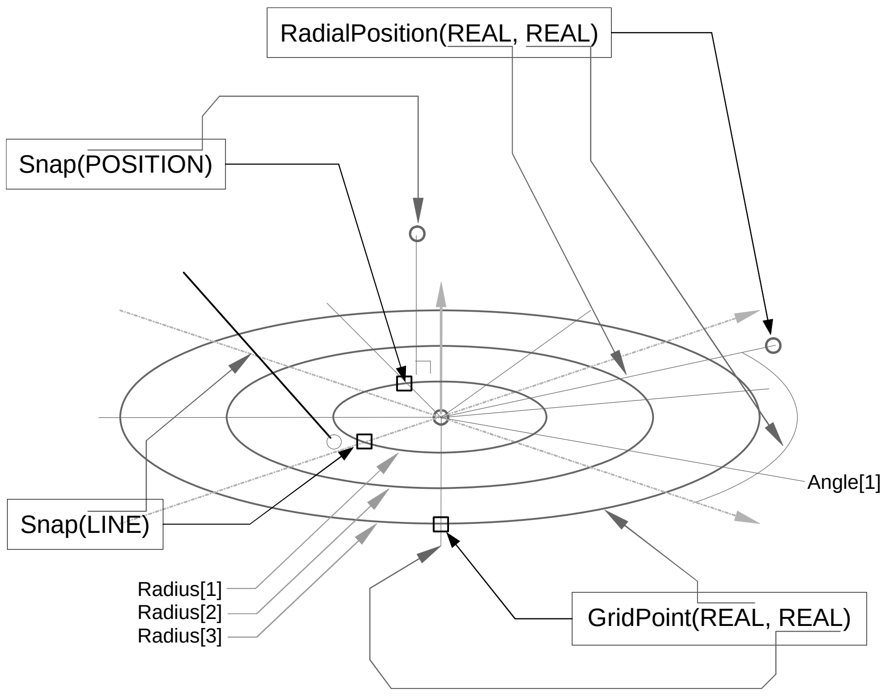


Figure 2:62. RADIALGRID Object Definition (b)

2.5.54 REAL Object

Methods

Name	Result	Purpose
`Real( BOOLEAN )`	REAL	Creates a REAL from the given BOOLEAN: TRUE = 1, FALSE = 0.
`Real( BORE )`	REAL	Creates a REAL from the given BORE.
`Real( STRING )`	REAL	Creates a REAL from the given STRING.
`Real( STRING, FORMAT )`	REAL	Creates a REAL from the given STRING in the specified format.
`ABS()`	REAL	Absolute value (make value positive).
`ACos()`	REAL	ACOS.
`ALog()`	REAL	ALOG.
`ASin()`	REAL	ASIN.
`ATan()`	REAL	ATAN.
`ATanT(REAL)`	REAL	ATANT.
`Between(REAL, REAL )`	BOOLEAN	TRUE if value lies in specified range including values specified.
`Boolean()`	BOOLEAN	FALSE if value is zero, otherwise TRUE.
`Bore()`	BORE	Convert to BORE (must be exact) dependent on current BORE units.
`Cosine()`	REAL	COSINE.
`Dimension()`	STRING	Give dimensions of value.
`Distance()`	STRING	Convert to a distance using default settings.

Name	Result	Purpose
`Distance(BOOLEAN feet, BOOLEAN us, BOOLEAN fraction, REAL precision, BOOLEAN zeroes)`	STRING	Convert to a distance : to feet & inches if feet (otherwise inches); to US format if us (otherwise PDMS format); use fraction if fraction (otherwise decimals); use precision as largest denominator or precision decimal places; output zeroes if zeroes (otherwise them).
`EQ(BORE)`	BOOLEAN	Comparison dependent on current BORE units.
`EQ(REAL)`	BOOLEAN	TRUE if equal.
`GEQ(BORE)`	BOOLEAN	Comparison dependent on current BORE units.
`GEQ(REAL)`	BOOLEAN	TRUE if greater than or equal to another value.
`GT(BORE)`	BOOLEAN	Comparison dependent on current BORE units
`GT(REAL)`	BOOLEAN	TRUE if greater than another value.
`INT()`	REAL	Convert to whole number, rounding down.
`LEQ(BORE)`	BOOLEAN	Comparison dependent on current BORE units.
`LEQ(REAL)`	BOOLEAN	TRUE if less than or equal to another value.
`LOG()`	REAL	LOG .
`LT(BORE)`	BOOLEAN	Comparison dependent on current BORE units.
`LT(REAL)`	BOOLEAN	TRUE if less than another value.
`NearestBore()`	BORE	Convert to nearest BORE dependent on current BORE units setting.
`Nint()`	REAL	Convert to nearest whole number (up or down).
`Power(REAL)`	REAL	Raise value to power.
`Real()`	REAL	Convert to REAL (in this case a null operation).

Name	Result	Purpose
`SBetween (REAL,REAL)`	BOOLEAN	TRUE if value lies in specified range excluding values specified.
`Sine()`	REAL	SINE.
`Sqrt()`	REAL	Square root of value.
`String(STRING precision)`	STRING	Convert to STRING with precision specified as a STRING in the range 'D0' to 'D6'.
`String(FORMAT)`	STRING	Convert to STRING using settings in global FORMAT object.
`Tangent()`	REAL	TANGENT.

Table 2: 104. REAL Object Methods

2.5.55 REPORT Object

The report object is used to format the table object data for displaying the contents of a table to the screen, forms or to file. Separating the formatting and extraction of the data from a table allows different reports to be generated from the same basic table.

The report extracts the data from a TABLE and formats each of the columns according to the associated COLUMNFORMAT object. You may optionally specify that only rows which contain a specified MATCH string (which may or may not be case-dependent) should be included it the report output.

The results may be extracted:

- all at once, using the `Results()` methods;
- a specified number of entries at a time, using the `NextEntries()`methods. Each entry will consist of one or more lines;
- a specified number of lines at a time, using the `NextLines()`methods. This may cause a partial entry to be returned at the end, but the next call to nextLines will fetch the remainder of the entry.

The first ARRAY argument provided to these methods will contain a set of STRINGs, each of which holds a **Dtext** row of data. If there is a second array argument, then this will contain the corresponding **Rtext**, which will be the name of the DBREF object associated with that row. For multi-line entries, the same **Rtext** value will be provided for each line.

Methods

Name	Result	Purpose
`Report()`		Constructor.
`Report(TABLE)`		Constructor that also sets the table and column formats.
`Table(TABLE)`		Sets the table to be used for the report.
`AddColumn(STRING key, COLUMNFORMAT, STRING heading)`		Adds the column with the specified key to the report, with the passed column format. The argument **heading** is the column heading.
`NextEntriesIndex(REAL position)`		Sets the position in the result array to be used for the next evaluation.
`NextEntriesIndex(REAL n, STRING)`		Sets the position in the matched result array to be used for the next evaluation.
`SetCaseMatch(BOOLEAN)`		Used in conjunction with the '…MATCH' methods, defines whether matching is case sensitive.
`Initialise()`		Re-initialises the next counter.
`EvaluateTable()`		Re-evaluates on the table primary key and re-sorts.
`Keys()`	STRING ARRAY	Returns an ARRAY of STRINGS that are the column keys used on this report.
`ColumnFormat(STRING key)`	COLUMN FORMAT	Returns the column format of the passed column key
`ColumnHeading (STRING key)`	STRING	Returns the heading of the column identified by key.
`Table()`	TABLE	Returns the table used in this report.
`CaseMatch()`	BOOLEAN	Queries whether the MATCH STRING is case sensitive. Set using `CaseMatch (BOOLEAN)`.

Name	Result	Purpose
`Results(ARRAY Dtext, ARRAY Rtext)`	BOOLEAN	Evaluates the report using all entries of the table (there may be more than 1 line per entry. If column formats cause a wrap-around **Rtext** will be repeated). The return is TRUE if there are entries to evaluate, FALSE if there are no entries. Both **Rtext** and **Dtext** must exist; they will be updated with the values.
`Results(ARRAY)`	BOOLEAN	As above but only **Dtext** is evaluated.
`ResultsMatch(STRING, ARRAY, ARRAY)`	BOOLEAN	Similar to `Results()` but only values matching the string are put into the two arrays.
`ResultsMatch(STRING, ARRAY)`	BOOLEAN	As above but only **Dtext** is evaluated.
`NextEntries(REAL n, ARRAY Dtext, ARRAY Rtext)`	BOOLEAN	Evaluates the report using the next n entries of the table (there may be more than 1 line per entry, if column formats cause a wrap-around the Rtext will be repeated). The return is TRUE if there are entries to evaluate, FALSE if there are no entries. Both **Rtext** and **Dtext** must exist; they will be updated with the next **n** values.
`NextEntries(REAL n, ARRAY)`	BOOLEAN	As above but only **Dtext** is evaluated.
`NextLines(REAL n, ARRAY Dtext, ARRAY Rtext)`	BOOLEAN	Evaluates the report with the next **n** lines of the table, if column formats cause a wrap-around the **Rtext** will be repeated. The return is BOOLEAN to indicate if there are lines to evaluate. Both **Rtext** and **Dtext** must exist; they will be updated with the next **n** values.

Name	Result	Purpose
`NextLines(REAL n, ARRAY)`	BOOLEAN	As above but only **Dtext** is evaluated.
`NextEntriesMatch (REAL n, STRING value, ARRAY Dtext, ARRAY Rtext)`	BOOLEAN	Similar to **NextEntries()** but only values matching **value** are put into the two arrays.
`NextEntriesMatch(REAL n, STRING value, ARRAY Dtext)`	BOOLEAN	As above but only **Dtext** is evaluated.
`NextEntriesIndex()`	REAL	Returns the current position in the array of entries.
`NextLinesIndex()`	REAL	Returns the current position in the array of entries.
`NextEntriesIndex (STRING)`	REAL	Returns the current count of the matched values array. STRING is a key word 'MATCH'.

Table 2: 105. REPORT Object Methods

2.5.56 RTOGGLE Gadget

Members

Name	Result	Purpose
`val`	BOOLEAN Get/Set	Current value true or false.
`index`	REAL Get Only	Index of radio button within the group.
`onVal`	STRING Get/Set	Associated selected value.
`offVal`	STRING Get/Set	Associated unselected value.
`visible`	BOOLEAN Get/Set	Visibility.
`active`	BOOLEAN Get/Set	Active (greyed-in) status.
`callback`	STRING Get/Set	Callback string.
`tag`	STRING Get/Set	Tag text.

Table 2: 106. RTOGGLE Object Members

Methods

Name	Result	Purpose
`FullName( )`	STRING	Get the full gadget name, e.g.'!!Form.gadget'.
`Name( )`	STRING	Get the gadget's name, e.g. 'gadget'.
`Owner( )`	FORM	Get owning form.
`SetPopup( MENU )`	NO RESULT	Links the given menu with the gadget as a popup.
`RemovePopup( MENU )`	NO RESULT	Removes the given popup menu from the gadget.
`GetPickedPopup( )`	MENU	Returns the last picked popup menu for the gadget.
`Refresh( )`	NO RESULT	Refreshes the display of the gadget.
`Shown( )`	BOOLEAN	Get ‘shown’ status.
`SetToolTip( STRING )`	NO RESULT	Sets or edits the text of the TOOLTIP.
`Type( )`	STRING	Get the gadget type as a string.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..

Table 2: 107. RTOGGLE Object Methods

Command

The RTOGGLE gadget (which is very similar to the TOGGLE gadget) is allowed only within FRAMES. You can added them to a FRAME with the usual positioning and layout commands. The RTOGGLE gadgets are implicitly numbered 1,2,3… as they are added.

The FRAME gadget can have an assigned callback, which is executed when the radio group selection is changed, i.e. whenever the user selects an unselected radio-toggle. As there is only a SELECT action supported, it can be either a simple callback or an open callback.

```
                    .-------<------------.
                   /                     |
>- RTOGgle gname -+- tagtext ------------|
                  +- CALLback text –-----|
                  +- <fgpos> ------------|
                  +- <fganch> -----------|
                  +- <fgdock> -----------|
                  +- TOOLTIP text -------|
                  +- CORE ---------------*  Core managed gadget
                  |
                  +- STATES offval onval --
.
                  ‘------------------------+- TOOLTIP text -.
                                           ‘----------------‘--->
```

Note: **offval** and **onval** are string values associated with the radio button states unselected or selected.
Default values are **onval** = ‘ON’, **offval** = ‘OFF’.

In order to simplify the task of replacing the use of the (now removed) RADIO gadget by the radio group Frame gadget, the RTOGGLE gadget’s UNSELECT events are raised only if a PML open callback has been defined. This allows the simple replacement of TOGGLE gadgets by RTOGGLE gadgets without the need to modify their callbacks.

2.5.57 Section Plane

The Section Plane object provides an interface for interrogating and modifying a Section Plane in the 3D View in Draft. It can be used in conjunction with the PMLSectionPlaneManager PML Object. In order to add a PMLSectionPlane to the 3D View, the PMLSectionPlaneManager must be used.

Set-up Methods

Method	Result	Purpose
`sectionPlane (DBREF)`	constructor	Creates the Section Plane Object with the given DBREF, which must represent a SPLA, PPLA or FPLA element

Display Methods

Name	Result	Purpose
`Redraw ()`	No Result	Redraw the plane in the 3D View. A plane is infinite in two directions, but is drawn with it's infinite edges clipped to the edges of the current drawlist. Therefore, if the plane is moved, or if the drawlist changes, the plane may need to be redrawn.
`Highlight ()`	No Result	Temporarily highlight the Section Plane in the 3D View.
`Show (BOOLEAN)`	No Result	Show/hide a plane in the 3D View.
`setClipping (BOOLEAN, DBREF)`	No Result	Set/unset the clipping status of the section plane within the VIEW. DBREF is the reference of the VIEW element
`switchClipside (DBREF)`	No Result	Switch between standard and reverse for which side of the section plane the model will be clipped. . DBREF is the reference of the VIEW element
`showClipItems (BOOLEAN, DBREF)`	No Result	Highlight the items in the 3d view that are in the clip list for this section plane. DBREF is the reference of the VIEW element
`redefinePoints (DIRECTION)`	No Result	Clear the points defining the section plane, and start a user interaction to redefine them. DIRECTION specifies the direction in which the lines between the points are to be extruded.
`Colour (REAL)`	No Result	Set the colour of the Section Plane (Real must be a colour.code())
`Translucency (REAL)`	No Result	Set the translucency of the Section Plane. 99 = transparent, 1 = opaque

Query Methods

Name	Result	Purpose
`isValid ()`	BOOLEAN	Checks if the section plane object is valid.
`queryDbref ()`	DBREF	Returns the actual database element.

`queryShow ()`	BOOLEAN	Get the show of the Section Plane
`queryClip ()`	BOOLEAN	Get the clipped value of the Section Plane
`queryType ()`	STRING	Get the types of the Section Plane. (SPLA, FPLA, PPLA)
`queryColour ()`	INTEGER	Get the colour of the Section Plane
`queryTranslucency ()`	INTEGER	Get the translucency of the Section Plane.

Table 2: 108. Selection Plane Object Methods

2.5.58 Section Plane Manager

The Graphical Section Plane Manager object provides an interface for interrogating and modifying Section Planes in the 3D View in Draft. It maintains a list of all PML SectionPlane objects that have been added to the 3D View.

Set-up Methods

Method	Result	Purpose
`SectionPlaneManager ()`	constructor	Creates the Section Plane Manager Object

Display Methods

Name	Result	Purpose
`initialise (BOOLEAN)`	No Result	True - Initialises Section plane mode. False - Uninitialise Section Plane mode.
`add (DBREF)`	No Result	If DBREF is a view then Add all Section Planes from a 2D View (Draft VIEW element) to the 3D View. If DBREF is a PLLB Add all Section Planes from a 2D Library to the 3D View. This includes all elements of the following types: • SPLA, PPLA, FPLA If DBREF is a SPLA, PPLA, or FPLA, then it will be added to the 3D View. A SECTIONPLANE object for each section plane added will be created and added to the list.
`add (SECTIONPLANE)`	No Result	Adds the SECTIONPLANE object to the 3D View.

`add (STRING)`	No Result	Creates a SECTIONPLANE object from the element with the given name and adds it to the 3D view.
`remove (DBREF)`	No Result	If DBREF is a SPLA, PPLA, or FPLA, then it will be removed from the 3D View. If the corresponding SECTIONPLANE object is in the list, it will be removed..
`remove (SECTIONPLANE)`	No Result	Removes the SECTIONPLANE object from the 3D View and the list.
`clear ()`	No Result	Clears all Section Planes from the 3D View .
`highlight (DBREF)`	No Result	Temporarily highlights the Section Plane with DBREF.
`redraw (DBREF)`	No Result	Redraw all planes in the 3D View. A plane is infinite in two directions, but is drawn with it's infinite edges clipped to the edges of the current drawlist. Therefore, if the plane is moved, or if the drawlist changes, the plane may need to be redrawn. DBREF is the reference of the VIEW element.
`clip (BOOLEAN)`	No Result	Clip/Unclip the 3D model (within the 3D View) with all the planes displayed in the 3D View. SPLA items will not be clipped.
`show (BOOLEAN)`	No Result	Show/hide all planes in the 3D View.
`showClipping (BOOLEAN)`	No Result	Show/hide the side of each section plane that will be clipped
`colour (REAL)`	No Result	Set the colour of All Section Planes (Real must be a colour.code())
`translucency (REAL)`	No Result	Set the transparency of All Section Planes.
`createPoints (STRING1,STRING2, DIRECTION)`	No Result	Creates an SPLA with the given name STRING1 in the PLLB named STRING2, extruded in the given DIRECTION.
`endCreatePoints`	No Result	Finish collecting points for the SPLA

Query Methods

Name	Result	Purpose
`query ()`	ARRAY of SECTIONPLANEs	Get all Section Planes in the 3D view
`querySelected ()`	DBREF	Return the DBREF of the selected Section Plane.

Create Methods

Name	Result	Purpose
`createSpla (name, library name, first point, second point, extrusion direction)`	SECTIONPLANE	Creates a new SPLA element with a specified name, which resides in a specific library. The first and second points represent the locations of the first two WPOS elements. (These will be created automatically by the system with default names). The extrusion direction must also be set. The new SPLA will be drawn in the 3D view.
`createFpla (name, library name, point, normal direction)`	SECTIONPLANE.	Creates a new FPLA element with a specified name, which resides in a specific library. The position and normal directions must be set. The new FPLA will be drawn in the 3D view.
`createPpla (name, library name, point)`	SECTIONPLANE.	Creates a new PPLA element with a specified name , which resides in a specific library. The position must be set. The new PPLA will be drawn in the 3D view.

Table 2: 109. Selection Plane Manager Object Methods

2.5.59 SELECTOR Gadget

Members

Name	Type	Purpose
`Add(STRING Dtext)`	NO RESULT	Append an entry to the list, where **Dtext** is the text to display in the option list.
`Add(STRING Dtext, STRING Rtext))`	NO RESULT	Append and entry to the list, where **Dtext** is the text to display in the option list, and **Rtext** is the replacement text for the new field. If **Rtext** isn't specified, it will be set to **Dtext** by default.
`Val`	REAL Get/Set	Selected field number of a single choice list. (1,2,…)
`Val`	ARRAY OF REAL Get/Set	Selected field numbers of a multiple choice list. (1,2,…)
`DText`	STRING ARRAY Get/Set	Set or get the entire list of display texts.
`DText[n]`	STRING Get Only	Get the display text of the **n**'th field.
`PickedField`	REAL Get Only	Last picked list field number.

Table 2: 110. SELECTOR Object Members

Methods

Name	Result	Purpose
`FullName()`	STRING	Get the full gadget name, e.g.'!!Form.gadget'.
`Name()`	STRING	Get the gadget's name, e.g. 'gadget'.
`Owner()`	FORM	Get the owning form.
`Shown()`	BOOLEAN	Get 'shown' status.
`Type()`	STRING	Get the GADGET type as a string.

Name	Result	Purpose
`Select(STRING text, STRING value)`	NO RESULT	Select specified item in a selector. `text` must be 'Rtext' or 'Dtext'. `value` is the field RTEXT or DTEXT to be selected.
`Select(STRING text, Array values)`	NO RESULT	Select multiple choice selector fields by value: `text` must be 'Rtext' or 'Dtext'. The `values` array contains the RTEXT or DTEXT of the fields to be selected.
`Selection(STRING text)`	STRING ARRAY OF STRING	Get current selection: `text` must be 'Rtext' or 'Dtext'. The value of `Selection` is the RTEXT or DTEXT of the selected field or fields.
`SetPopup(MENU)`	NO RESULT	Links the given menu with the gadget as a popup.
`SetFocus()`	NO RESULT	Move keyboard focus to this gadget.
`SetToolTip(STRING)`	NO RESULT	Sets or edits the text of the TOOLTIP.
`Refresh()`	NO RESULT	Refreshes the display of the gadget.
`RemovePopup(MENU)`	NO RESULT	Removes the given popup menu from the gadget.
`GetPickedPopup()`	MENU	Returns the last picked popup menu for the gadget.
`Clear()`	NO RESULT	Clear selector contents.
`ClearSelection()`	NO RESULT	Clear selections only.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..

Table 2: 111. SELECTOR Object Methods

Command

The SELECTOR command defines a database element selector gadget and specifies its position, tag, and callback text. Also specifies whether the selector allows a single choice only or multiple choices and defines the area (width and height) in which the displayed part of the list will appear. It also allows you to specify which parts of the hierarchy are shown and whether or not these are updated automatically during database navigation.

```
                     .-------<---------.
                    /                  |
>- SELector gname -+-- <fgpos> --------|
                   +-- tagtext --------|
                   +-- <fganch> -------|
                   +-- <fgdock> -------|
                   +-- TOOLTIP text ---|
                   +-- CALLback text --*
                   +-- SINGle -.
                   +-----------'- <vshap> DATAbase -+- MEMbers -.
                   |                                +- OWNers --|
                   |                                '-----------+-AUTO-.
                   |                                            '------|
                   '- MULTiple <vshap> DATAbase ---+- MEMbers ---------|
                                                   |- OWNers ----------|
                                                   '-------------------|
                                                                     |
                                                   .-------<-----------*
                                                  |
                                                   +-- TOOLTIP text --.
                                                  '-----------------'->
```

Figure 2:63. Syntax Graph -: Setting up a SELECTOR Object

Default: Single choice. If DATABASE is not qualified, default is Members ***plus*** Owners. Auto update off.

2.5.60 SESSION Object

Members

Name	**Type**	**Purpose**
`UniqueID`	STRING Get/Set	Internal ID
`Name`	STRING Get/Set	Session Name
`Login`	STRING Get/Set	User's login ID
`Host`	STRING Get/Set	ID of the Machine running the session
`Entered`	STRING Get/Set	Time of entering the session
`LocationName`	STRING Get/Set	Name of Location for Session
`IsRemote`	STRING Get/Set	True for Sessions at Remote locations
`IsCurrent`	BOOLEAN Get/Set	TRUE for User's own SESSION object

Table 2: 112. SESSION Object Members

Methods

Name	**Result**	**Purpose**
`SESSION (STRING)`	SESSION	Returns a SESSION object, given a string containing a session's Unique-id.
`ConfirmID (STRING)`	BOOLEAN	Returns TRUE if the password specified by the STRING is correct for the currently logged-in user. (The STRING value must include the leading '/' character).
`Current()`	ARRAY OF DB	List of Current DBs in the MDB of the SESSION object.
`Deferred()`	ARRAY OF DB	List Deferred DB's in the MDB of the SESSION object.

Name	Result	Purpose
`Location()`	LOCATION	Return LOCATION to which the Session applies. In a non-Global project, returns NULL or error.
`MDB()`	MDB	The current MDB of the SESSION.
`Mode()`	ARRAY OF STRING	List of potential access modes as ‘R’ , ‘RW’ or ‘N’ for each of the current DBs.
`Modified()`	BOOLEAN	TRUE if database has been modified.
`Module()`	STRING	Name of the current module.
`Status()`	ARRAY OF STRINGS	List of current access modes as ‘R’ , ‘RW’ or ‘N’ for each of the current DBs.
`User()`	USER	The user of this SESSION object.

Table 2: 113. SESSION Object Methods

Note:

- The **LocationName** member and `Location()` method imply the location to which the Session applies. This is normally the current location, except when Sessions at remote locations have been requested. In a non-Global project, these members and methods may be unavailable or unset.
- Some ADMIN Sessions in a Global project may apply to another location's system database. This will be returned as part of the string returned by the `Module()` method, if relevant. Other ADMIN Sessions may actually be Global Daemon Sessions. This is returned as part of the string for the **name** member.
- Some SESSION object methods have only restricted availability:
  - The `Modified()` method only applies to the current Session at the current location.
  - The `Current()`, `Deferred()`, `Mode()` and `Status()` methods will not be implemented for remote Sessions and will return an error.
  - The `Location()`, `MDB()`, `User()` and `Module()` methods are valid for remote Sessions.

The last three methods will cause Daemon activity for Sessions at remote locations.

- It should be should be observed in using the MDB and USER objects returned by the `MDB()` and `User()` methods for a remote Session. Methods on these objects will access the currently open system database. Thus the appropriate location's system database should be opened (using the `ADMINISTER SYSTEM` command) before invoking methods on these remotely generated MDB and USER objects.

Command

```
!SESSION = CURRENT SESSION
```
$ Returns the current session object.

2.5.61 SLIDER Gadget

Members

Name	Type	Purpose
`visible`	BOOLEAN Get/Set	Visibility.
`active`	BOOLEAN Get/Set	Active (greyed-in) status.
`callback`	STRING Get/Set	Callback string.
`tag`	STRING Get/Set	Tag text - not displayed for this gadget.
`val`	REAL Get/Set	Current value as integer.
`background`	REAL Get/Set	Background Colour Number.
`background`	STRING Set only	Background Colour Name.
`range`	REAL ARRAY Get/Set	Range Start, End and optional Step(>0) as integers. The start value may be less than the end value. Array size must be 2 or more.
`tickstyle`	REAL Get/Set	Tick style as integer. 0 - none, 1 - right or bottom, 2 top or left, 3 - both 1 and 2

Table 2: 114. SLIDER Object Members

Note:

- The **Val** member represents the current value of the slider as a PML REAL (in fact always an integer).
- The **Range** member allows the slider range and optionally the step value to be set or queried. The granularity of the slider movement is determined by the specified step increment, i.e. a move event is generated at each step increment within the slider's range. The range limits must each be an integral multiple of the step size (else an error is flagged
  The RESET action of a form (from reset, CANCEL or QUIT actions) will only reset the

slider current value not other slider properties. So if you redefine the range while a form is displayed, and press the **RESET** button, the range will not revert to the previous settings. You will have to do this from reset button's callback and/or the form's CANCELCALL callback.

- Tick marks, if present, occur at every step value in the range.

Methods

Name	Result	Purpose
`FullName()`	STRING	Get the full gadget name, e.g.'!!Form.gadget'.
`Name()`	STRING	Get the gadget's name, e.g. 'gadget'.
`Owner()`	FORM	Get owning form.
`SetToolTip(STRING)`	NO RESULT	Sets or edits the text of the Tooltip.
`Shown()`	BOOLEAN	Get 'shown' status.
`Type()`	STRING	Get the gadget type as a string i.e. 'SLIDER'.
`Refresh()`	NO RESULT	Refresh gadget image.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..
`SetFocus()`	NO RESULT	Set keyboard focus to gadget. Allows arrow keys to drive slider.

Table 2: 115. SLIDER Object Methods

Command

```
                    .-------<-------------------.
                   /                            |
>-- SLIDER gname -+- tagtext -------------------|
                  +- <fgpos> -------------------|
                  +- CORE ----------------------|  Core managed gadget
                  +- <fganch> ------------------|
                  +- <fgdock> ------------------|
                  +- BACKGround <colno> --------|
                  +- CALLback text -------------|
                  +- TOOLTIP text --------------|
                  +- VERTical ------------------|
                  +- HORIZontal ----------------*
                  |
                  | .-------<-------------------.
                  |/                            |
                  +- RANGE int int -------------|
                  +- STEP int ------------------|
                  +- VALue int -----------------*
                  |
                  '- <vshap> -+- TOOLTIP text -.
                              '----------------'-->
```

Figure 2:64. Syntax Graph -: Creating a SLIDER Object

Note: The user can specify the range as *start, end* and optional *step* and *value* integer values.
The <vshap> graph allows the specification of the WIDTH and/or HEIGHT for sliders, in grid units. The width must be specified for a horizontal slider, and the height must be specified for a vertical slider. If the other dimension is not specified then a default size will be assumed.
The tag text is not displayed for a slider gadget.

2.5.62 STRING Object

Methods

Name	Result	Purpose
`String(BLOCK)`	STRING	Creates a STRING from a BLOCK expression.
`String(BOOLEAN)`	STRING	Creates a STRING equal to TRUE or FALSE.
`String(BOOLEAN,FORMAT)`	STRING	Creates a STRING from a BOOLEAN, as specified in the FORMAT object.
`String(BORE)`	STRING	Creates a STRING from a BORE.

Name	Result	Purpose
`String(BORE,FORMAT)`	STRING	Creates a STRING from a BORE, as specified in the FORMAT object.
`String(DB)`	STRING	Creates a STRING containing the DB name.
`String(DB,FORMAT)`	STRING	Creates a STRING containing the DB name. The FORMAT argument is required for consistency by Forms and Menus.
`String(DIRECTION)`	STRING	Creates a STRING from a DIRECTION.
`String(DIRECTION,FORMAT)`	STRING	Creates a STRING from a Direction, as specified in the FORMAT object.
`String(MDB)`	STRING	Creates a STRING containing the MDB name.
`String(ORIENTATION)`	STRING	Creates a STRING from an Orientation.
`String(ORIENTATION,FORMAT)`	STRING	Creates a STRING from an Orientation, as specified in the FORMAT object.
`String(POSITION)`	STRING	Creates a STRING from a POSITION.
`String(POSITION,FORMAT)`	STRING	Creates a STRING from a POSITION, as specified in the FORMAT object.
`String(PROJECT)`	STRING	Creates a STRING containing the PROJECT code.
`String(REAL)`	STRING	Creates a STRING from a REAL.
`String(REAL,FORMAT)`	STRING	Creates a STRING from a REAL, as specified in the FORMAT object.
`String(REAL,STRING)`	STRING	Creates a STRING from a REAL. The STRING argument is present for converting the number of decimal places when given in the obsolete format Dn.
`String(SESSION)`	STRING	Creates a STRING containing the SESSION number.

Name	Result	Purpose
`String(TEAM)`	STRING	Creates a STRING containing the TEAM name.
`String(USER)`	STRING	Creates a STRING containing the USER name.
`After(STRING two)`	STRING	Return sub-string following leftmost occurrence of sub-string **two.**
`Before(STRING two)`	STRING	Return sub-string before leftmost occurrence of sub-string **two.**
`Block()`	BLOCK	Make STRING into a BLOCK for evaluation.
`Boolean()`	BOOLEAN	TRUE if STRING is 'TRUE', 'T', 'YES' or 'Y'; FALSE if STRING is 'FALSE', 'F', 'NO',or 'N'.
`Bore()`	BORE	Convert STRING to a BORE (exact conversion - see also NEARESTBORE).
`Bore(FORMAT)`	BORE	Convert STRING to a BORE using the settings in the global FORMAT object.
`DBRef()`	DBREF	Convert STRING to a DBREF.
`DBRef(FORMAT)`	DBREF	Convert STRING to a DBREF using the settings in the global **format** object.
`Direction()`	DIRECTION	Convert STRING to a DIRECTION.
`Direction(FORMAT)`	DIRECTION	Convert STRING to a DIRECTION using the settings in the global **format** object.
`DLength()`	REAL	As `Length()` but for multibyte characters
`DMatch(STRING)`	REAL	As `Match()` but for multibyte characters.
`DSubstring(REAL)`	STRING	As `Substring()` but for multibyte characters.
`DSubstring(REAL,REAL)`	STRING	As `Substring()` but for multibyte characters.

Name	Result	Purpose
`Empty()`	BOOLEAN	TRUE for empty zero-length string.
`Length()`	REAL	Number of characters in string.
`LowCase()`	STRING	Convert string to lower case.
`LT(STRING)`	BOOLEAN	Comparison using ASCII collating sequence.
`Match(STRING two)`	REAL	Location of start of sub-string **two** within first string - zero returned if not found.
`MatchWild(STRING two)`	BOOLEAN	TRUE if strings are the same. STRING **two** may contain wildcard characters: ·* for any number of characters ·? for any single character.
`MatchWild(STRING two, STRING multiple)`	BOOLEAN	TRUE if strings are the same as above but **multiple** redefines the wildcard for any number of characters.
`MatchWild(STRING two, STRING multiple,STRING single)`	BOOLEAN	TRUE if strings are the same as above but **multiple** redefines the wildcard for any number of characters and **single** also redefines that for a single character.
`Occurs(STRING)`	REAL	Returns the number of occurrences of the given string.
`Orientation()`	ORIENTATION	Convert STRING to an ORIENTATION.
`Orientation(FORMAT !!format)`	ORIENTATION	Convert STRING to an ORIENTATION using the settings in the global **!!format**.
`Part(REAL nth)`	STRING	Extract **nth** field from string where fields are delimited by space, tab or newline.
`Part(REAL nth,STRING delim)`	STRING	Extract **nth** field from string where fields are delimited by **delim**.
`Position()`	POSITION	Convert STRING to a POSITION.

Name	Result	Purpose
`Position(FORMAT !!format)`	POSITION	Convert STRING to a POSITION using the settings in the global **!!format** object.
`REAL()`	REAL	Convert to a number.
`Replace(STRING two,STRING three)`	STRING	Replace all occurrences of sub-string two with sub-string **three**.
`Replace(STRING two,STRING three,REAL nth)`	STRING	Replace all occurrences of sub-string **two** with sub-string **three** starting at the **nth** occurrence (or **-nth** occurrence from the end).
`Replace(STRING wo,STRINGthree,REAL nth,REAL count)`	STRING	Replace **count** occurrences of sub-string **two** with sub-string **three** starting at the **nth** occurrence (or -nth occurrence from the end).
`Split()`	ARRAY	Split string into an ARRAY of STRINGS at space (multiple spaces compressed).
`Split(STRING elim)`	ARRAY	Split string into an ARRAY of STRINGS at **delim** (multiples of **delim** not compressed).
`String(FORMAT)`	STRING	Convert STRING to a STRING using the settings in the global FORMAT object.
`Substring(REALindex)`	STRING	Returns a sub-string from **index** to the end of the string
`Substring(REAL index,REAL nchars)`	STRING	Returns a sub-string, **nchars** in length, starting at **index**.
`Trim()`	STRING	Remove initial and trailing spaces.
`Trim(STRING‘options’)`	STRING	Remove initial spaces (**options** =‘L’), trailing spaces (**options** = ‘R’) or both (**options** =’LR’).
`Trim(STRING options,STRING char)`	STRING	Reduce multiple occurrences of **char** to a single occurrence throughout the STRING (options = ‘M’).
`UpCase()`	STRING	Convert STRING to upper case.

Name	Result	Purpose
`VLogical()`	BOOLEAN	Evaluate STRING as a BOOLEAN.
`VText()`	STRING	Evaluate STRING as a STRING.
`VValue()`	REAL	Evaluate STRING as a REAL.

Table 2: 116. STRING Object Methods

2.5.63 STATE

The STATE object provides an interface for interrogating and modifying the status of modify mode. It is only available to Design running in graphical mode.

Method	Result	Purpose
`state ()`	constructor	
`modifyMode ()`	BOOLEAN	Returns TRUE if modify mode is on; else returns FALSE
`modifyMode (BOOLEAN)`	none	Sets modify mode on or off
`enableModifyMode ()`	BOOLEAN	Returns TRUE if modify mode is enabled, else returns FALSE
`enableModifyMode (BOOLEAN)`	BOOLEAN	If TRUE, then modify mode is enabled. If FALSE, modify mode is disabled unless it is already on, in which case this method has no effect. The method returns TRUE if the action is successful, else returns FALSE.
`.featureHighlight (BOOLEAN)`	No Result	If TRUE, then features (ppoints, plines, vertices, etc) are temporarily highlighted in the 3d view as the cursor passes over them. Setting this to FALSE turns this feature off.

Table 2: 117. STATE Object Method

2.5.64 TABLE Object

The TABLE object is used to hold raw data in a manner that can be manipulated in a tabular manner, i.e. as a spreadsheet. Each row of the table represents a DBREF, and is defined by the primary key. The columns of the table contain information about the DBREF according to the associated COLUMN object.

Sorting of the table is by the order of the columns and the sort criteria on the relevant column. The formatting of the table data is via a REPORT object, which will allow the same data to be represented in many different ways.

Methods

Name	Result	Purpose
`Table()`		Constructor (initialises all the object settings)
`Table(DBREF ARRAY, COLUMN ARRAY)`		Constructor that passes the Primary Key as an ARRAY of DBREFS and the columns as an ARRAY of COLUMNS
`Table(COLLECTION, COLUMNARRAY)`		Constructor that passes the Primary Key as a COLLECTION and the columns as an ARRAY of COLUMNS.
`PrimaryKey(COLLECTION)`		User defined Primary Key populated directly from a COLLECTION.
`PrimaryKey(ARRAY of DBREF)`		User defined Primary Key.
`Column(REAL n, COLUMN)`		Replaces the -nth column of the table.
`ClearColumns()`		Clears all the columns from the table.
`Columns(COLUMN ARRAY)`		Sets up the columns from an ARRAY of COLUMN objects.
`Evaluate()`		Evaluates the complete table.
`EvaluatePrimaryKey()`		Re-evaluates the Primary Key collection.
`PrimaryKey()`	DBREF ARRAY	Returns the primary Key of the table, reference list for the columns of the table.
`Columns()`	COLUMN ARRAY	Returns the column definitions. The order of the columns is important when sorting.
`Cell(REAL column, REAL row)`	ANY	Returns the contents of the cell at the **column** and **row**.
`Column(REAL, n)`	ARRAY	Returns the contents of **nth** column.

Name	Result	Purpose
`Row(REAL, n)`	ARRAY	Returns the contents of **nth** row.
`Cell(STRING key, DBREF)`	ANY	Contents of the cell at the column and row.
`Column(STRING key)`	ARRAY	Returns the contents of column identified by **key**.
`Row(DBREF)`	ARRAY	Returns the contents of row identified by DBREF.

Table 2: 118. Table -:TABLE Object Methods

2.5.65 TEAM Object

Members

Name	Type	Purpose
`Name`	STRING	Name of the TEAM, up to 32 characters.
`Description`	STRING	TEAM description, up to 120 characters.
`Refno`	STRING	STRING containing Database reference number.

Table 2: 119. TEAM Object Members

Methods

None of these methods modifies the original object.

Name	Result	Purpose
`DbList()`	ARRAY OF DB	List of DBs owned by the TEAM.
`UserList()`	ARRAY OF USER	List of USERS in the TEAM.
`TEAM(DBREF)`	TEAM	Returns a TEAM object, given a DBREF.
`TEAM(STRING)`	TEAM	Returns a TEAM object, given a name or reference number.

Table 2: 120. TEAM Object Methods

These methods may be used in the following ways

```
!D = OBJECT TEAM(!!CE)
!D = OBJECT TEAM(!!CE.Name)
!D = !!CE.TEAM()
!D = !!CE.Name.TEAM()
```

In all cases **!!CE** is assumed to be a DB database element and **!!CE.Name** is a STRING object containing the element's name.

These methods should assist performance improvements to AppWare by making it easier to get from Database element to Object.

Command

```
!ARRAY = TEAMS        $ Returns an array of TEAMs
```

2.5.66 TEXT Gadget

Members

Name	Type	Purpose
`Val`	STRING Get/Set	Set or get the contents of STRING type TEXT field.
`Val`	REAL Get/ Set	Set or get the contents of REAL type TEXT field.
`Val`	BOOLEAN Get/Set	Set or get the contents of BOOLEAN type TEXT field.
`Val`	'AS DEFINED Get/Set	Set or get the contents of the field according to the user defined type.
`DataType`	STRING Get Only	Get the type of the field.
`Echo`	BOOLEAN Get Only	Get the Echo Status. No-echo means that typed characters will all appear as asterisks.
`Format`	STRING Get Only	Get the name of the format object associated with the field.
`Scroll`	REAL Get Only	Get the Scroll Width.
`ValidateCall`	STRING Get/Set	Set/get user-defined validation callback.
`Editable`	BOOLEAN Get/Set	Controls the ability to interactively edit the content of a text field.

Table 2: 121. TEXT Object Members

Methods

Name	**Result**	**Purpose**
`FullName()`	STRING	Get the full gadget name, e.g.'!!Form.gadget'.
`Name()`	STRING	Get the gadget's name, e.g. 'gadget'.
`Owner()`	FORM	Get owning form.
`Clear()`	NO RESULT	Clear gadget contents.
`SetEditable(BOOLEAN)`	NO RESULT	Sets the editable status for the field.
`SetFocus()`	NO RESULT	Move keyboard focus to this gadget.
`SetToolTip(STRING)`	NO RESULT	Sets or edits the text of the TOOLTIP.
`Refresh()`	NO RESULT	Refreshes the display of the gadget.
`SetValue(ANY value, BOOLEAN validate)`	NO RESULT	Sets the value of the field, checking for valid type and format. If `validate` is TRUE, the validation callback will be executed.
`GetPickedPopup()`	MENU	Returns the last picked popup menu for the gadget.
`Shown()`	BOOLEAN	Get 'shown' status.
`Type()`	STRING	Get the gadget type as a string i.e. 'TEXT'.
`Seteditable( STRING attrib, REAL value)`	NO RESULT	Specify value of named attribute. Currently the only attribute supported is HANDLEMODIFY which determines when the text MODIFIED events are fired. It has values: 0 MODIFIED events off (default). 1 Generate MODIFIED event for first user modification. 2 Generate MODIFIED event for all user modifications.

Table 2: 122. TEXT Object Methods

Command

The TEXT command defines a text field gadget which supports data values of a given type.

The following can also be specified; Gadget position, tag, size, callback, dock, anchor and tooltip; maximum length of the string that may be scrolled in the gadget; the name of a format object which says how a value is to appear as text or be interpreted; that text entered is not echoed as typed, but appears as asterisks (for entering passwords, for example); that the field contents can be seen but not edited.

You can define the TEXT object to be either PML-controlled, or core-code controlled using the gadget qualifier attribute *control type*, with values ‘PML” or “CORE”.

```
                   .--------<-------------.
                  /                       |
>-- TEXT gname --+-- <fgpos> -------------|
                 +-- CORE ----------------|  Core managed gadget
                 +-- <fgtagw> ------------|
                 +-- <fganch> ------------|
                 +-- <fgdock> ------------|
                 +-- TOOLTIP text --------|
                 +-- CALLback text -------*
                 |    .---------<---------.
                 |   /                    |
                 ‘--*-- WIDth integer ----|
                    +-- SCRoll integer ---|
                    +---NOEcho------------*
                    |
                    ‘-- IS --+-- STRING --.
                             +-- REAL ----|
                             +-- BOOLEAN -|
                             ‘-- word ----+- FORMAT gvarnm -.
                                          ‘-----------------+- TOOLTIP text -.
                                                            ‘----------------‘-->
```

Figure 2:65. Syntax Graph -: Setting Up a TEXT Object

The ***IS word*** syntax allows for any user defined data type to be used, but this will only work satisfactorily if a suitable FORMAT object is supplied.

Note: The maximum string length (SCROLL ***integer***) is 256 characters, and the default if you do not specify a length is 132.
It is bad practice to place one gadget on top of another. This may lead to gadgets being obscured.

2.5.67 TEXTPANE Gadget

Members

Name	Type	Purpose
`Val`	ARRAY OF STRING Get/Set	Get or set the contents of the text pane.
`Count`	REAL Get Only	Get the number of lines of text in the gadget.

Table 2: 123. TEXTPANE Gadget Members

Methods

Name	Result	Purpose
`FullName()`	STRING	Get the full gadget name, e.g.'!!Form.gadget'.
`Name()`	STRING	Get the gadget's name, e.g. 'gadget'.
`Owner()`	FORM	Get owning form.
`Clear()`	NO RESULT	Clear all lines from the gadget
`Line(REAL )`	STRING	Get the text of given line
`SetLine(REAL, STRING)`	NO RESULT	Replace specified line number by STRING.
`CurPos()`	ARRAY[2] OF REAL	Get cursor position (line, character).
`SetCurPos(REAL[2])`	NO RESULT	Set cursor position (line, character).
`SetCurPos(REAL, REAL)`	NO RESULT	Set cursor position (line, character).
`SetEditable(BOOLEAN)`	NO RESULT	Set edit status.
`SetPopup(MENU)`	NO RESULT	Links the given menu with the gadget as a popup.
`RemovePopup(MENU)`	NO RESULT	Removes the given popup menu from the gadget.
`GetPickedPopup()`	MENU	Returns the last picked popup menu for the gadget.
`SetToolTip(STRING)`	NO RESULT	Sets or edits the text of the TOOLTIP.
`Refresh()`	NO RESULT	Refreshes the display of the gadget.
`Shown()`	BOOLEAN	Get ‘shown’ status.
`Type()`	STRING	Get the gadget type as a string.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..

Table 2: 124. TXTPANE Gadget Methods

Command

The TEXTPANE command defines a text pane gadget and specifies its position and tag. This is a multi-line text input field, allowing the user to enter a number of lines of text (either directly or using cut and paste). Note that no callback string is allowed with this gadget, as there is no way of knowing when a user has finished entering text.

The value of a TEXTPANE is its contents, held as an array of strings, where each line is an element of the array.

You can define the BUTTON to be either PML-controlled, or core-code controlled using the gadget qualifier attribute *control type*, with values ‘PML” or “CORE”.

```
                       .--------<--------.
                      /                  |
>-- TEXTPane gname --+-- tagtext---------|
                     +-- <fganch> -------|
                     +-- <fgdock> -------|
                     +-- <fgpos> --------|
                     +-- CORE -----------*  Core managed gadget
                     ‘-- <vshap> --->
```

Figure 2:66. Syntax Graph -: Setting Up a TEXTPANE Object

Note: It is bad practice to place one gadget on top of another. This may lead to gadgets being obscured.

2.5.68 TOGGLE Gadget

Member

Name	Type	Purpose
`Val`	BOOLEAN Get/Set	Toggles value between TRUE and FALSE.

Methods

Name	Result	Purpose

`AddPixmap(STRING file1, STRING file2, STRING file3 )`
`AddPixmap(STRING file1, STRING file2)`
`AddPixmap(STRING file )`
	NO RESULT	Adds pixmaps to be used for the unselected, selected and inactive states. The last two are optional.

`FullName()`	STRING	Get the full gadget name, e.g.'!!Form.gadget'.
`Name()`	STRING	Get the gadget's name, e.g. 'gadget'.
`Owner()`	FORM	Get owning form.
`SetFocus()`	NO RESULT	Moves keyboard focus to this gadget.
`SetPopup(MENU)`	NO RESULT	Links the given menu with the gadget as a popup.
`RemovePopup(MENU)`	NO RESULT	Removes the given popup menu from the gadget.
`GetPickedPopup()`	MENU	Returns the last picked popup menu for the gadget.
`Refresh()`	NO RESULT	Refreshes the display of the gadget.
`Shown()`	BOOLEAN	Get ‘shown’ status.
`SetToolTip`	STRING	Sets or edits the text of the TOOLTIP.
`Type()`	STRING	Get the gadget type as a string.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..

Table 2: 125. TOGGLE Object Methods

Command

The TOGGLE command defines a toggle gadget, and specifies its position, tag, and callback text. Also allows you to specify different text strings for the default ON and OFF states.

You can define the TOGGLE to be either PML-controlled, or core-code controlled using the gadget qualifier attribute *control type*, with values ‘PML” or “CORE”.

```
                   .-------<------------.
                  /                     |
>- TOGGLE gname -+- <fgtagw> -----------|
                 +- PIXMAP <vshap> -----|
                 +- CALLback text —-----|
                 +- <fgpos> ------------|
                 +- <fganch> -----------|
                 +- <fgdock> -----------|
                 +- TOOLTIP text -------|
                 +- CORE ---------------*  Core managed gadget
                 +- STATES text1 text2 -.
                 ‘----------------------+- TOOLTIP text -.
                                        ‘----------------‘--->
```

Figure 2:67. Syntax Graph -: Setting Up a TOGGLE Object

where ***text1*** corresponds to the OFF setting and ***text2*** corresponds to the ON setting.

Note: It is bad practice to place one gadget on top of another. This may lead to gadgets being obscured.

Default:	Default text strings for the two toggle settings are ‘OFF’ and ‘ON’. Default state when a toggle is first defined is ‘OFF’; i.e. button raised.

Pixmaps associated with Toggle gadgets can be changed after the gadgets have been displayed on a form.

Method syntax:

AddPixmap(!pixmap1 is STRING)

AddPixmap(!pixmap1 is STRING, !pixmap2 is STRING)

Where: !pixmap is a string holding the file pathname of the required .png file, e.g.

%pmllib%\png\camera.png

!pixmap1 shows the Un-selected state of the gadget, and pixmap2 shows the Selected state.

Notes:

1. It is recommended that when you define the gadget you set its size to encompass the largest pixmap which you will later add. Failure to do this may give rise to unexpected behaviour.

2. Historically you could add a third pixmap which was used when the gadget was de-activated. This practice is no longer necessary as the gadget pixmapped is automatically greyed-out on de-activation.

2.5.69 UNDOABLE Object

This object allows you to add functionality to the undo and redo stacks.

Methods

Name	Result	Purpose
`description(STRING)`	NO RESULT	Adds description text to the **undoable**
`add()`	NO RESULT	Marks the database with the description text and adds this **undoable** to the undo stack
`endundoable()`	NO RESULT	Marks the database again at the end of the change.
`undoAction (STRING)`	NO RESULT	Specify a command to be executed when this **undoable** is taken off the undo stack
`redoAction(STRING)`	NO RESULT	Specify a command to execute when this **undoable** is taken off the redo stack.
`clearAction(STRING)`	NO RESULT	Specify a command to execute when this **undoable** is cleared without any associated undo/redo being performed.

Table 2: 126. PMLUndoable Object Methods

Command

To use this object, first create an undoable object, and define the `undoAction()`, `redoAction()` and `clearAction()` methods to define the execution strings.

Call the method `add()` to mark the database and add the undoable object to the undo stack.

Make the set of changes that you may wish to undo, then call the method `endundoable()` to mark the end of the changes.

2.5.70 USER Object

Member

Name	**Result**	**Purpose**
`Name`	STRING	The name of the User, up to 32 characters.
`Description`	STRING	User's description, up to 120 characters.
`Access`	STRING	User's access rights (FREE, GENERAL, RESTRICTED).
`Refno`	STRING	STRING containing Database reference number.

Table 2: 127. USER Object Members

Method

Name	**Result**	**Purpose**
`TeamList()`	ARRAY OF USERS	List of TEAMs including this USER.
`WorkingList()`	ARRAY OF DB OBJECTS	List of working extract DBS owned by a User.
`Password()`	STRING	No value
`USER(DBREF)`	USER	Returns a USER object, given a DBREF.
`USER(STRING)`	USER	Returns a USER object, given a name or reference number.

Table 2: 128. USER Object Methods

These methods may be used in the following ways:

```
!D = OBJECT USER(!!CE)

!D = OBJECT USER(!!CE.Name)

!D = !!CE.USER()

!D = !!CE.Name.USER()
```

In all cases **!!CE** is assumed to be a DB database element and **!!CE.Name** is a STRING object containing the element's name.

These methods should assist performance improvements to AppWare by making it easier to get from Database element to Object.

Command

```
!ARRAY = USERS          $ Returns an array of USER objects in current project.
```

2.5.71 VERIFY

VERIFY object is used directly to verify that the executing user is on a list of approved users and is running on an approved host computer, and is running within a given time period. If the condition is not met the command script terminates immediately with a "Verification error".

Methods

Name	Result	Purpose
`Verify( )`	PMLUSERLOGIN	Construct an instance of this object
`After(DATETIME)`	NO RESULT	Verify after the specified date
`Before(DATETIME)`	NO RESULT	Verify before the specified date
`Hostname(STRING)`	NO RESULT	Verify current computer hostname matches single hostname passed as STRING
`Hostname(ARRAY)`	NO RESULT	Verify current computer hostname matches one of a set of hostnames passed as ARRAY of STRING
`WinUser(STRING)`	NO RESULT	Verify current Windows user matches single username passed as STRING
`WinUser(ARRAY)`	NO RESULT	Verify current Windows user matches one of a set of usernames passed as ARRAY of STRING

Table 2: 129. VERIFY Object Method

2.5.72 ViewFinder

The ViewFinder object is to allow the Draft PML user to create a frame in the 3d view which represents the view frame in the 2d view. Once drawn, the frame can be moved, rotated, change its representation (but not its size). By manipulating the frame in the 3d view, the user can modify the view parameters in the current drawing.

Set-up Methods

Name	Purpose
`.viewFinder(DBREF)`	Creates a viewfinder object based on the parameters of the Draft View. The input argument must be the dbref of a valid View .
`.view(DBREF)`	Sets the associated View object using the DBREF which must be a valid view

Methods

Name	Result	Purpose
`.redraw()`	No Result	Redraws the box using current state of View parameters
`.update3d()`	No Result	Regenerates frame and 3d model view from the 2d view
`.colour ( REAL)`	No Result	Changes colour to the PDMS colour number specified
`.translucency(BOOLEAN)`	No Result	Switches translucency on or off
`.align()`	No Result	Aligns the viewfinder frame with the 3d view direction
`.lock(BOOLEAN)`	No Result	Locks/unlocks the frame so it cannot be moved
`.dynamic(BOOLEAN)`	No Result	If true, update design will automatically occur whenever the frame is moved
`.hide()`	No Result	Makes the frame invisible
`.show()`	No Result	Makes the frame visible. Also expands the clipping planes to make sure they include the frame.

Query Methods

Name	Result	Purpose
`.valid()`	BOOLEAN	Is the viewfinder valid. This will be true if it was created with a valid View, otherwise false
`.view()`	DBREF	Returns the dbref of the associated view object
`.position()`	POSITION	Returns the position of the centre of the viewfinder frame.
`.direction()`	DIRECTION	Returns the direction of the View associated with the viewfinder

`.size()`	ARRAY of REAL	Returns the size of the viewfinder frame (as Xnnn Ynnn)
`.dynamic()`	BOOLEAN	Returns true if in dynamic mode

Table 2: 130. ViewFinder Object Methods

2.5.73 VIEW Gadget: ALPHA Views

Members

Name	Type	Purpose
`Channel`	STRING Get/Set	Get or set the assigned channel.

Table 2: 131. VIEW ALPHA Object Members

Methods

Name	Result	Purpose
`Clear()`	NO RESULT	Clear all lines from the Alpha TTY window.
`Refresh`	NO RESULT	Refreshes the display of the gadget.
`SetFocus()`	NO RESULT	Set the keyboard focus immediately to this Alpha gadget.
`removeRequests()`	NO RESULT	Deletes the ‘requests’ channel from the alpha view gadget, and dissociates it from the current Requests IO-channel if necessary.
`Background()`	STRING	Get Background Colour Name. Some gadgets do not support this property in all circumstances, e.g. gadgets which are showing a pixmap. Gadgets whose colour has not been set explicitly, may not have a colour with a known colourname. In this case an error is raised..

Table 2: 132. VIEW ALPHA Object Methods

Command

The VIEW ... ALPHA command puts you into View Setup mode. You remain in View Setup mode until you use the EXIT command.

```
           .-------------------------<--------------------------.
          /                                                     |
(ALPha)--+- <vshap> ------------------------------------.       |
         +- CHANNEL -+- COMMANDS ------------------------|       |
         |           '- REQUESTS ------------------------'- NL -*
         '-- EXIT -->
```

Figure 2:68. Syntax Graph -22: Setting Up an ALPHA VIEW Object

2.5.74 VIEW Gadget: AREA View

Members

Name	Type	Purpose
`Limits`	REAL ARRAY[4] Get/Set	Get or set limits box [x1,y1,x2,y2].
`Borders`	BOOLEAN Get/Set	Get or set borders ON (TRUE) or OFF (FALSE).
`Background`	REAL Get/ Set	Get or set background Colour Number
`Background`	STRING Set Only	Set background Colour Name.
`Contents`	REAL ARRAY[2] Get/Set	Get or set User contents ID.
`Defcall`	STRING Get/Set	Get or set default interaction callback.
`Height`	REAL Get Only	Get view height.
`Highlight`	REAL Get/ Set	Get or set highlight Colour Number.
`Highlight`	STRING Set Only	Set highlight Colour Name
`Prompt`	GADGET Get/Set	Get or set User Prompt PARAGRAPH gadget.
`Subtype`	STRING Get Only	Get subtype of graphic view.
`Width`	REAL Get Only	Get view width.

Table 2: 133. VIEW AREA Object Methods

Methods

Name	Result	Purpose
`Background()`	STRING	Returns the highlight colour as a name string.
`Clear()`	NO RESULT	Clear VIEW contents
`Highlight()`	STRING	Returns the highlight colour as a name string.
`Refresh()`	NO RESULT	Refreshes the display of the gadget
`RestoreView(REAL storeNumber)`	NO RESULT	Restores the saved VIEW with the given store number.
`SaveView(REAL storeNumber)`	NO RESULT	Saves the current VIEW. The number must be in the range 1 to 4.
`SetSize(REAL width, REAL height)`	NO RESULT	Set VIEW size.

Table 2: 134. VIEW AREA Object Methods

Command

The VIEW ... AREA command puts you into View Setup mode. You remain in View Setup mode until you use the EXIT command.

```
           .--------------------------<------------------------.
          /                                                    |
(AREa) --+- <vshap> ------------------------------------.      |
         +- PUT - <sgid> -------------------------------|      |
         +- LIMits <uval> <uval> - TO - <uval> <uval> -|       |
         +- SETColour - <colno> ------------------------|      |
         +- SETHighlight - <colno> ---------------------‘- NL -|
         +- <cursor> ------------------------------------------|
         +- <border> ------------------------------------------|
         +-- <pml> --------------------------------------------*
         ‘-- EXIT -->
```

Figure 2:69. Syntax Graph -: Setting Up an AREA VIEW Object

DRAFT where <sgid> is either CE (current element) or the name of a 2D graphical element (e.g., a DRAFT SHEET, VIEW, LIBRARY, etc.) and <colno> is any valid DRAFT colour definition.

And <cursor> is the syntax for selecting the cursor type, as follows:

```
>-- CURSortype ---+-- POINTER ----.
                  +-- NOCURSOR ---|
                  +-- PICK -------|
                  +-- PICKPLUS ---|
                  ‘-- CROSSHAIR --‘-->
```

Figure 2:70. Syntax Graph -: Setting Up the Cursor Type

<border> allows control of zooming and panning:

```
>--- BORDers --+-- ON --.
               ‘-- OFF -‘--->
```

Figure 2:71. Syntax Graph -: Setting Up the Border

2.5.75 VIEW Gadget: PLOT View

Members

Name	**Type**	**Purpose**
`Background`	REAL Get/ Set	Get or set background Colour Number.
`Background`	STRING Set Only	Set background Colour Name.
`Borders`	BOOLEAN Get/Set	Get or set borders ON (TRUE) or OFF (FALSE).
`Contents`	REAL ARRAY[2] Get/Set	Get or set User Contents ID.
`Defcall`	STRING Get/Set	Get or set default interaction callback.
`Height`	REAL Get Only	Get view height.
`Highlight`	REAL Get/ Set	Get or set highlight Colour Number.
`Highlight`	STRING Set Only	Set highlight Colour Name.
`Prompt`	GADGET Get/Set	Get or set User Prompt PARAGRAPH gadget.
`Subtype`	STRING Get Only	Get subtype of graphic view.
`Width`	REAL Get Only	Get view width.

Table 2: 135. VIEW PLOT Object Members

Methods

Name	Result	Purpose
`Add(STRING)`	NO RESULT	Add plot file with name given by STRING. Replaces given plot file if any.
`Background()`	STRING	Returns the background colour as a name STRING.
`Clear()`	NO RESULT	Clear gadget contents
`Highlight()`	STRING	Returns the highlight colour as a name STRING.
`Refresh()`	NO RESULT	Refreshes the display of the gadget
`SetSize(REAL width, REAL height)`	NO RESULT	Set view size.

Table 2: 136. VIEW PLOT Object Methods

Command

The VIEW ... PLOT command puts you into View Setup mode. You remain in View Setup mode until you use the EXIT command.

```
           .-------------------------<------------------------.
          /                                                    |
(PLOT) --+- <vshap> ----------------------------------.        |
         +- ADD - plot_filename -----------------------|       |
         +- CLear --------------------------------------|       |
         +- SETColour - <colno> -----------------------|       |
         +- SETHighlight - <colno> --------------------'- NL -|
         +- <cursor> -----------------------------------------|
         +- <border> -----------------------------------------|
         +-- <pml> --------------------------------------------*
         '-- EXIT -->
```

Figure 2:72. Syntax Graph -: Setting Up a PLOT VIEW Object

where:

<colno> is any valid PDMS colour definition.

<cursor> is the syntax for selecting the cursor type, as in 2-19

<border> allows control of zooming and panning as in 2-20

2.5.76 VIEW Gadget: VOLUME Views

Members

Name	**Type**	**Purpose**
`Background`	REAL Get/Set	Get or set Background Colour Number
`Background`	STRING Set Only	Set Background Colour Name.
`Contents`	REAL ARRAY[2] Get/Set	Get or set User Contents ID.
`Defcall`	STRING Get/Set	Get or set default interaction callback.
`Height`	REAL Get Only	Get View Height.
`Highlight`	REAL Get/Set	Get or set Highlight Colour Number.
`Highlight`	STRING Set Only	Set Highlight Colour Name.
`Prompt`	GADGET Get/Set	Get or Set User Prompt paragraph gadget.
`Subtype`	STRING Get Only	Get Subtype of graphic view.
`Width`	REAL Get Only	Get View Width.
`Borders`	BOOLEAN Get/Set	Get or set Borders ON (TRUE) or OFF (FALSE).
`Direction`	REAL ARRAY[3] Get/Set	Direction vector [dE,dN,dU].
`EyeMode`	BOOLEAN Get/Set	TRUE for Eyemode FALSE for Modelmode.
`Limits`	REAL ARRAY[6] Get/Set	Limits box [E1,E2,N1,N2,U1,U2].
`Mousemode`	STRING Get/Set	'ZOOM', 'PAN', 'ROTATE', WALK'.
`Projection`	STRING Get/Set	‘PERSPECTIVE’ or ‘PARALLEL’.

Name	Type	Purpose
`Radius`	REAL Get/ Set	View Radius distance >0.
`Range`	REAL Get/ Set	Range distance >0.
`Refresh`	NO RESULT	Refreshes the display of the gadget.
`RestoreView`	REAL Get/ Set	Restores view saved as given view number.
`SaveView`	REAL Get/ Set	Saves view as given view number, in the range 1 to 4.
`Shaded`	BOOLEAN Get/Set	TRUE for shaded FALSE for wireline.
`Step`	REAL Get/ Set	Step size >0.
`Through`	REAL ARRAY[3] Get/Set	Through point [E,N,U].
`WalkThrough`	BOOLEAN Get/Set	TRUE for Walkthrough (equivalent to Eyemode).
`LabelStyle`	STRING Get/Set	Set by specifying 'ENU' or 'XYZ'. Default is 'ENU'.

Table 2: 137. VIEW VOLUME Members

Methods

Name	Result	Purpose
`Background()`	STRING	Returns the BACKGROUND colour as a name string.
`Highlight()`	STRING	Returns the HIGHLIGHT colour as a name string.
`SetSize(REAL width, REAL height)`	NO RESULT	Set view size.
`RestoreView(REAL storeNumber)`	NO RESULT	Restores view saved as given view number.
`SaveView(REAL storeNumber)`	NO RESULT	Saves view as given view number.

Table 2: 138. VOLUME VIEW Object Methods

Command

The VIEW ... VOLUME command puts you into View Setup mode. You remain in View Setup mode until you use the EXIT command.

```
(VOLume)--+-- LOok --+-- <dir> --------------------.
          |          |-- THRough---.               |
          |          |-- FROM -----|               |
          |          '-- TOWards --+-- <pos> ----. |
          |                        |-- <gid> ----| |
          |                        '-- ID @ NL --'--|
          +-- ISOmetric --+-- value --.             |
          |               '-----------'-------------|
          +-- PLAN ---------------------------------|
          +-- ELEVation -- (one of N/S/E/W/X/Y) ----|
          +-- CLIPping -----+-- ON --.              |
          |                 '-- OFF -'--------------|
          +-- CAPping ------+-- ON --.              |
          |                 '-- OFF -'--------------|
          +-- PERSPective --+-- ON --.              |
          |                 '-- OFF -'--------------|
          +-- WALKthrough --+-- ON --.              |
          |                 '-- OFF -'--------------|
          +--RADius --- value ----------------------|
          +--STEP ----- value ----------------------|
          '--RANGE ---- value ----------------------'--->
```

Figure 2:73. Syntax Graph -: Setting Up a VOLUME VIEW Object

Where:

<colno> is any valid DESIGN colour definition; either a colour description or a colour number

<cursor> is the syntax for selecting the cursor type, as in 2-19

<border> allows control of zooming and panning as in 2-20

Default: Borders:ON; Shading OFF.

View direction:PLAN or LOOK DOWN.

Limits: AUTO (set to current view limits).

2.5.77 XYPosition Object

Members

Name	Type	Purpose
X	REAL Get/Set	X component of 2D POSITION.
Y	REAL Get/Set	Y component of 2D POSITION.

Table 2: 139. XYPOSITION Object Members

Methods

Name	Result	Purpose
`XYposition()`	XYPOSITION	Creates an XYPOSITION at the given coordinates.
`String()`	STRING	Returns a XYPOSITION as a STRING.

Table 2: 140. XYPOSITION Object Methods

A Communicating with Review

This chapter describes the sample application provided with Review, and should be read in conjunction with the *Review User Guide*, where the commands available from the command line for controlling Review are explained. It also explains the responses to these commands that may be returned from Review.

The Review commands available constitute a subset of the full Review functionality, together with some special commands for sending commands in batches.

Note: Where **primary element** is referred to in this Appendix, this means an element that can be claimed.

A.1 Invoking the Command Line Interface

You invoke the command line interface in Review via the Applications icon in the Review user interface.

A.2 Directing Commands to Review

In order to direct any command line to Review, prefix the line with the command

Review

The remaining part of the line may be:

- A command sequence for controlling one or more of Review’s functions;
- An instruction to send one or more preceding command lines to Review.

  This prefix is incorporated into all commands described in the remainder of this chapter.

A.3 Sending Commands to Review

You may send command lines to Review in one of two ways:

- Automatically, as soon as the ***newline*** character is entered to terminate the command line;
- In batch mode, by entering an explicit instruction to send one or more previously entered command lines

Review refreshes its display every time a received instruction has been completely processed, which can make the automatic sending of each command line inefficient compared with batch mode operation (where the display is refreshed only once for the whole command sequence).

Review Command	Description
Review AUTOsend ON	Automatically send commands line-by-line.
Review AUTOsend OFF	Stop sending the commands automatically and revert to batch mode (which is the default).
Review SEND	Pass a batch of commands to Review explicitly (valid only with Autosend mode Off). This command will send all command lines that have been entered since the preceding Review SEND command. Consider, for example, the following command lines (which are numbered for reference purposes only): 1. **Review MATERIAL 1 RGB 10 10 10** 2. **Review ELEMENT /C1101 MATERIAL 1** 3. **Review SEND** 4. **Review ELEMENT /C1002 MATERIAL 1** 5. **Review SEND** By default, batch mode is in operation (i.e. Autosend mode is Off). Therefore lines 1 and 2, which hold Review functional commands, are not passed to Review until the explicit command to do so is given in line 3. Similarly, the command in line 5 causes line 4 (only) to be passed to Review.

A.4 Errors from the Application-to-Review Link

The error messages below come from one of the two the following sources, rather than from the results of the commands themselves.

Problems with the Application Module

```
(79, 101)   Environment variable CADC_IPCDIR unset
(79, 102)   Cannot start communications: error
```

Problems with the Communications Link between Applications and Review

```
(79, 201) Commands sent automatically as AUTOSEND is enabled
(79, 202) Cannot connect to Review: error
(79, 203) Cannot start command transfer to Review: error
(79, 204) No commands to send to Review
(79, 205) Cannot send commands to Review: error
(79, 206) Cannot end transfer to Review: error
(79, 207) Cannot start transfer from Review: error
(79, 208) Cannot receive reply from Review: error
(79, 209) Cannot receive the error message from Review: erro
          r
```

A.5 Sample Application

Note: The sample application supplied is for demonstration purposes ***only***. By default it uses flat files as the data source. Note also that you should cancel the Login form displayed when the demonstration application is run.

The first stage of the sample application is concerned with *progress monitoring*, covering both the design and construction phases. It uses the sample model to give a clear presentation of the current status of the project, which is particularly useful during concurrent design and construction.

The second stage focuses on extracting a range of *engineering data* available from the model, including the display of P&IDs, vendor drawings and scanned images, data sheets, and reports.

The third part of the application focuses on the operating life of the plant, such that items requiring *maintenance* can be interrogated by reference to a *timebase*.

Maintenance history can be studied for past problems and recommendations; maintenance procedures can be displayed to show the scope of the work involved. Cost-benefits can be seen by obtaining the isolation group associated with a given element; for example, the Main Separator Tower may be highlighted together with an adjacent control valve which is to be maintained at the same time.

A set of fully documented forms and macros are supplied to support these engineering applications, based around the Stabiliser model. These applications are summarised in more detail in the following sections.

A.6 Progress Monitoring

The Progress Monitoring application is based on the need to view different engineering disciplines of a Plant that are at various stages of completion. Relevant information can then be displayed and highlighted within Review.

The engineering disciplines recognised by the application are:

- Piping
- Mechanical
- Vessels
- Structural
- Instruments

For each discipline, the completion status, each of which is displayed within Review in a different colour, may be any of the following:

Completion Status	Display Colour
Preliminary Design	Green
Final Design	Cyan
Fabricated	Blue
Erected	Purple
Tested	Brown

A.6.1 Engineering Data

The Engineering Data application is based on the need to derive engineering data which relates to a graphical element selected within the Review display; for example:

- Purchase order data;
- Descriptions;
- Document availability and viewing capability;

  Once these data have been supplied, a further selection can be made to display related documents and drawings through other applications. Examples supplied will allow access to plotfiles, ASCII and scanned image files.

The Maintenance application is based on the need to view different types of Plant elements which require maintenance at different time intervals. Maintenance activities can then be selected for further data analysis and display within Review.

The types of design element recognised by the application are:

- Vessels
- Exchangers
- Mechanical
- Instruments
- All

For each element type, the maintenance interval, specified in terms of the date when maintenance is next due, may be any of the following:

- Overdue
- Due today
- Due next week
- Due next month

When applied for a selected Element Type and Due On, all available data will be displayed to show which elements require maintenance and when. These elements can then be selected for further maintenance enquiries by selecting one or more the following options:

- Maintenance schedule
- Maintenance history
- Parts inventory
- Isolation list

A.7 Using the Sample Application

First ensure that all software has been installed as explained in the Review *Installation Guide*. Then open a window and type:

```
% run_demo
```

Review will load its graphics and the sample model onto the screen. Click on the Application's icon to start the demonstration. The icon should look like the one below:

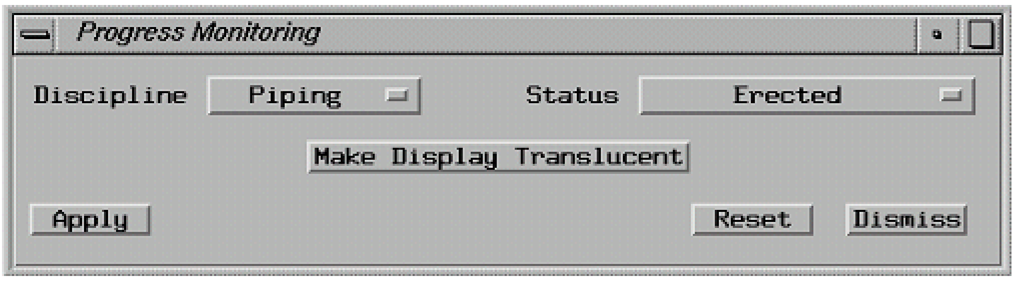
You will then see a Data Server Login form, which you should cancel for this flat file demonstration.

Note: The file `run_demo` is located under the demo directory where the software was installed. Read the `rvq_docs/README` file for hints on how (if you're an experienced Query Toolkit user) you can customise the application for use with an external database.

A.7.1 Progress Monitoring

Select **Applications>Progress Monitoring**

A form will be displayed, as shown in *Figure A:1.: Progress Monitoring form*, to enable you to access data relevant to the completion status for a particular discipline.



Discipline: Piping
Status: Erected

Figure A:1. Progress Monitoring form

Use the two option gadgets on this form to set the required combination of design *Discipline* (e.g. Piping) and corresponding completion *Status* (e.g. Erected).

Click the **Apply** button to highlight items meeting the selection criteria within the Review model. Different colours will be used for the various Status options.

Click the **Make Display Translucent** button to reset all materials in the Review display to translucent to enable different Discipline and Status combinations to be selected and viewed.

Progress Monitoring Examples

Select and then apply the following combinations:

Combination	Result
Discipline=Piping and Status=Erected	Pipes are displayed in purple
Discipline=Vessels and Status=Delivered	Vessels are displayed in blue
Discipline=Vessels and Status=Installed	Vessels are displayed in purple
Discipline=Structural and Status=Erected	Steelwork is displayed in purple
Discipline=Instr/Elect and Status=Fabricated	Instrument Cabinets are displayed in blue*
Discipline=Mechanical and Status=Tested	Pumps are displayed in brown*

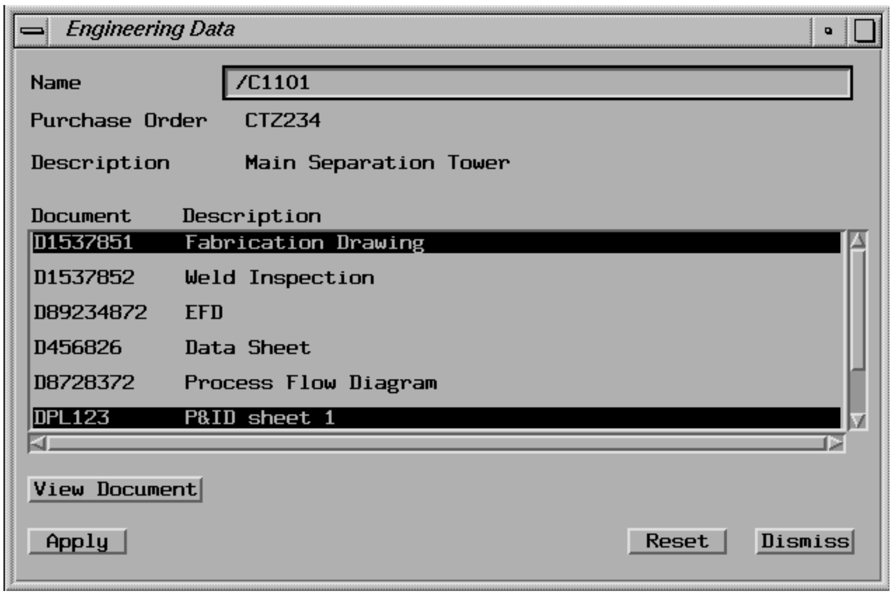
* To get the best display, **Select Look > ISO > One** from the Review bar menu.

A.7.2 Engineering Data

Select **Applications > Engineering Data**.

A form will be displayed, as shown in *Figure A:2.: Engineering Data form*, to enable you to extract engineering data relevant to the model.

In the Review display, select the *central upright vessel* (/C1101) using the cursor and left-hand mouse button. Now select the **Name** field on the Engineering Data form and paste in the name of the selected vessel by clicking the right-hand mouse button.


Engineering Data

Name	/C1101
Purchase Order	CTZ234
Description	Main Separation Tower

Document	Description
D1537851	Fabrication Drawing
D1537852	Weld Inspection
D89234872	EFD
D456826	Data Sheet
D8728372	Process Flow Diagram
DPL123	P&ID sheet 1

Figure A:2. Engineering Data form

Click the **Apply** button to display data for the specified vessel against the headings **Purchase Order** and **Description**.

A list of associated documents will be shown under the **Document** and **Description** headings. To display such a document, first select the line for that document in the scrollable list and then click the **View Document** button. The resulting document display may be:

- a text file, using the system editor;
- a plotfile representation of orthogonal views of a drawing;
- a scanned image of a drawing.

Note: Any external application may be used to display documents. Any number of documents may be selected simultaneously for viewing.

Document Examples

Names can be selected graphically or by entering an explicit name.

Name: /C1101

D1537851	Fabrication Drawing	Displays a plotfile of the Main Separation Tower.
DPL123	P&ID sheets 1-3	Each displays a P&ID plotfile.

Name: /P1501A

D8428797	2D Drawing	Displays a set of orthogonal views.
D43173298	Bill of materials	Displays a BOM report for Pump P1501A.
ER3245-001	Cable List Report	Displays a cable connection list report.

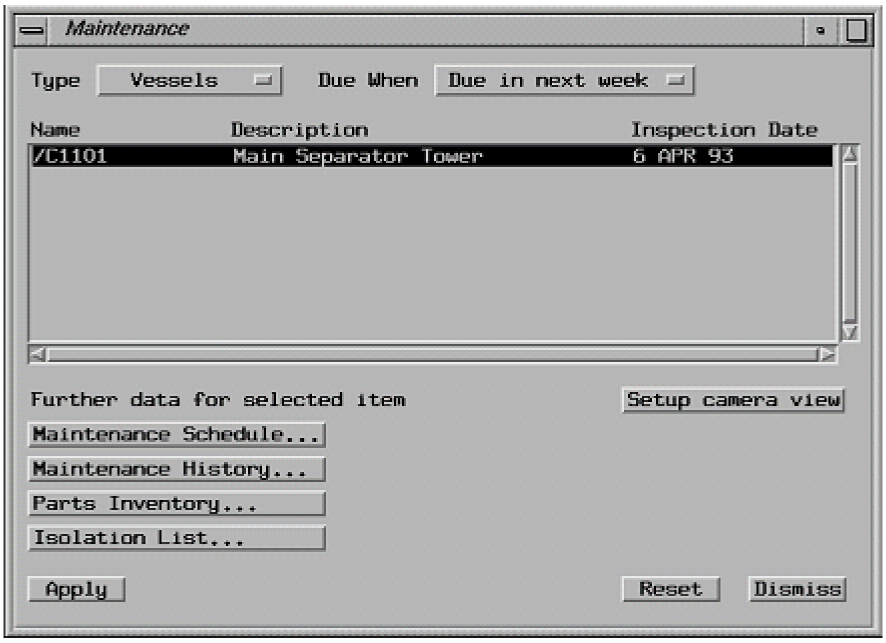
Name: /V-70

D7862134	Cross Sectional View	Displays a scanned image of a valve.

A.7.3 Maintenance

Select **Applications > Maintenance**.

A form will be displayed, as shown in *Figure A:3.: General Maintenance Form*, to enable you to access data relating to those items which require maintenance within specific time periods.


Maintenance

Type Vessels Due When Due in next week

Name	Description	Inspection Date
/C1101	Main Separator Tower	6 APR 93

Figure A:3. General Maintenance Form

Use the two option gadgets on this form to set the required combination of item **Type** (e.g. Vessels) and time when next maintenance operation is due, shown as **Due When** (e.g. Due in next week).

Click the **Apply** button to highlight items meeting the selection criteria within the Review model.

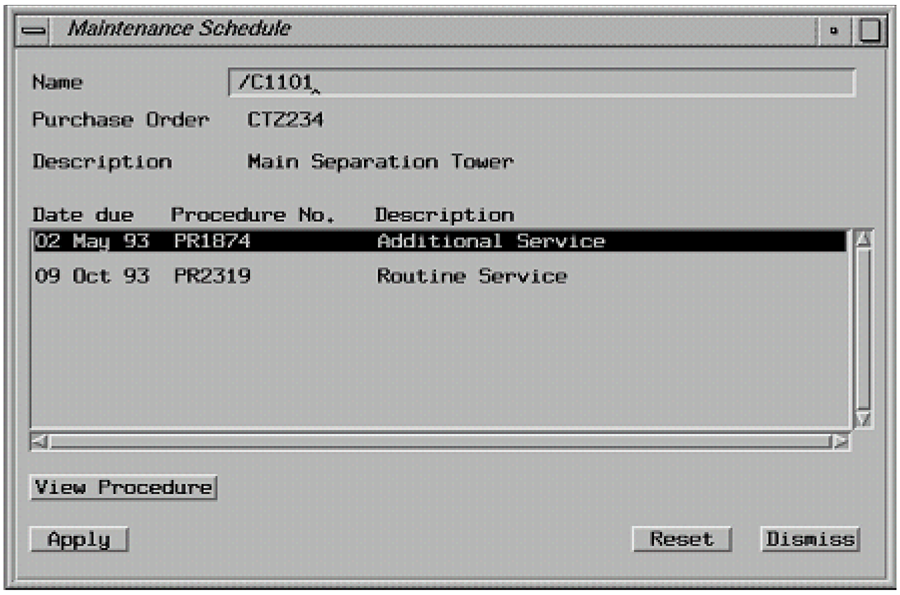
To make it easier to see the selected item in the Review display, click the **Setup camera view** button. This sets up Camera One such that the through point is at the item of interest, with a field of view of 60°.

The **Name**, **Description** and **Inspection Date** for each relevant item will be listed on the form under the corresponding headers. To obtain detailed maintenance data for any item, select the item in the scrollable list and then click the appropriate button under the heading **Further data for selected item.** The data available come under the following headings:

- Maintenance Schedule
- Maintenance History
- Parts Inventory
- Isolation List

Maintenance Schedule

The Maintenance Schedule form, as illustrated in *Figure A:4.: The Maintenance Schedule Form*, allows you to view the maintenance procedures that have been generated for a named model item.



Name	/C1101
Purchase Order	CTZ234
Description	Main Separation Tower

Date due	Procedure No.	Description
02 May 93	PR1874	Additional Service
09 Oct 93	PR2319	Routine Service

Figure A:4. The Maintenance Schedule Form

To display any of the maintenance procedures listed for the current item, select the procedure in the scrollable list and then click the **View Procedure** button. The selected report will be displayed (in read-only mode) to show details of the maintenance procedures.

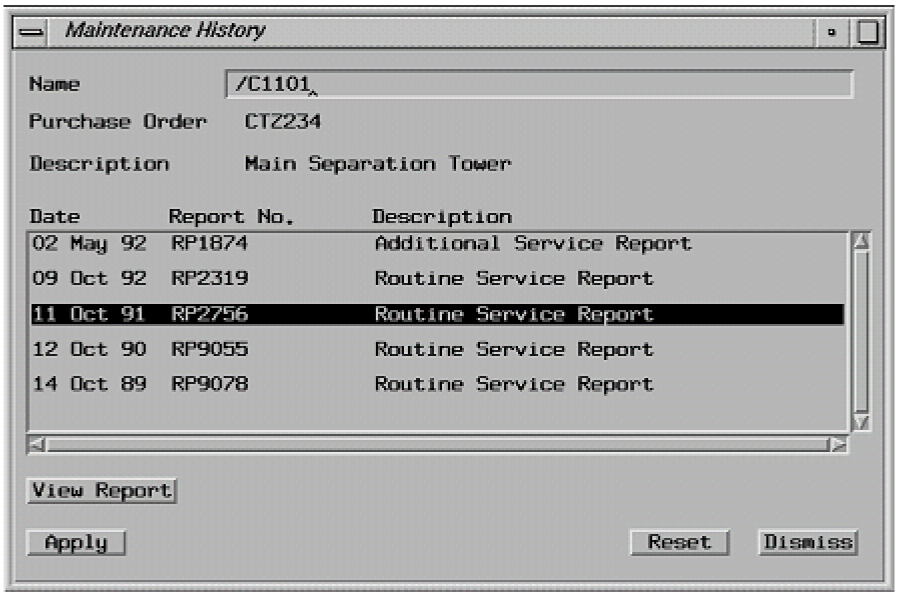
To list the available maintenance procedures for a different model item without returning to the General Maintenance form, enter the new item name and click the **Apply** button.

Maintenance History

The Maintenance History form, as illustrated in *Figure A:5.: Maintenance History Form*, allows you to view the maintenance history reports that have been generated for a named model item.

To display any of the maintenance reports listed for the current item, select the report in the scrollable list and then click the **View Report** button. The selected report will be displayed (in read-only mode) to show details of the maintenance history.

To list the available maintenance reports for a different model item without returning to the General Maintenance form, enter the new item name and click the **Apply** button.



Maintenance History

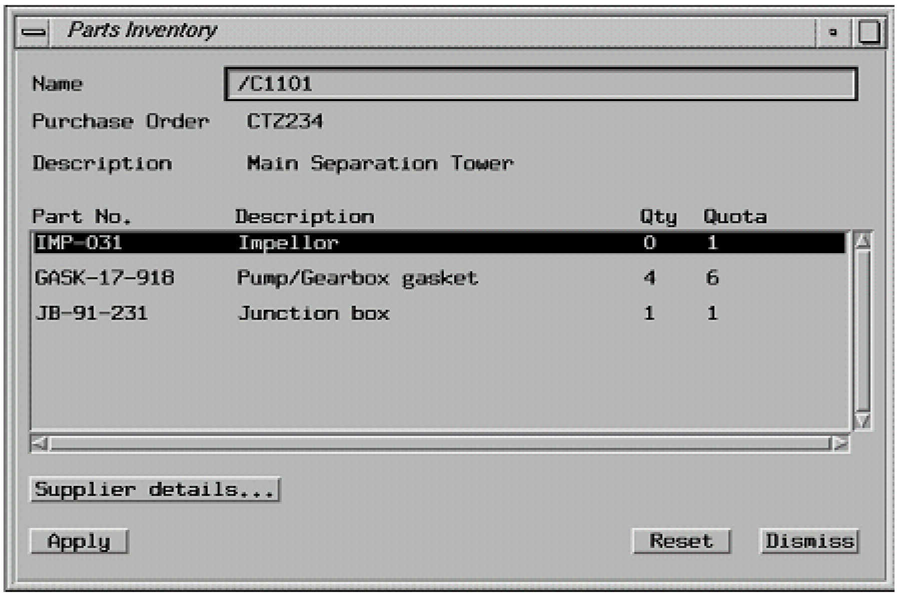
Name	/C1101
Purchase Order	CTZ234
Description	Main Separation Tower

Date	Report No.	Description
02 May 92	RP1874	Additional Service Report
09 Oct 92	RP2319	Routine Service Report
11 Oct 91	RP2756	Routine Service Report
12 Oct 90	RP9055	Routine Service Report
14 Oct 89	RP9078	Routine Service Report

Figure A:5. Maintenance History Form

Parts Inventory

The Parts Inventory form, illustrated in *Figure A:6.: Parts Inventory Form*, allows you to view supplier details that have been generated for a named model item.



Parts Inventory

Name	/C1101
Purchase Order	CTZ234
Description	Main Separation Tower

Part No.	Description	Qty	Quota
IMP-031	Impellor	0	1
GASK-17-918	Pump/Gearbox gasket	4	6
JB-91-231	Junction box	1	1

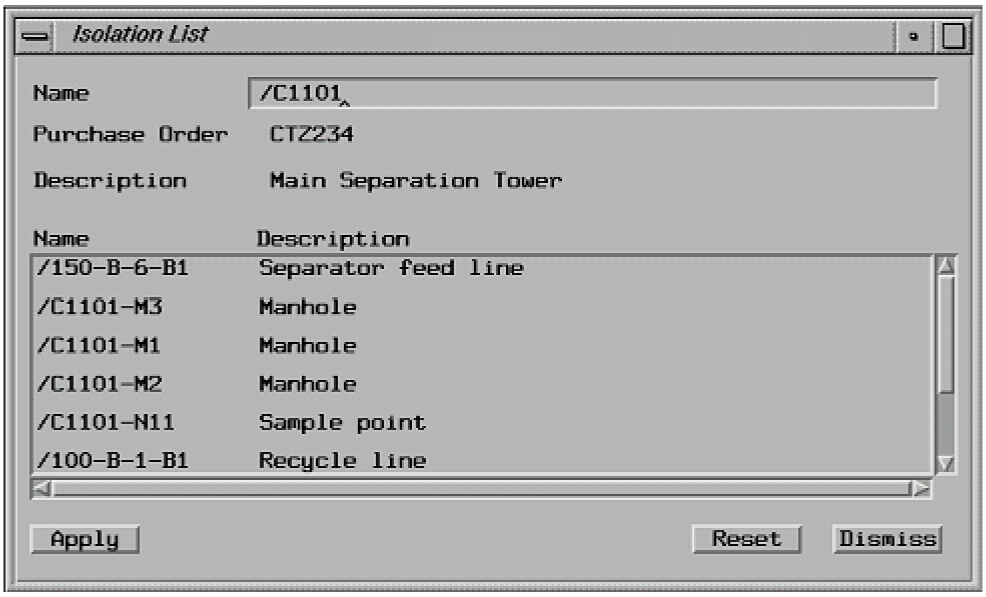
Figure A:6. Parts Inventory Form

To display details of any part listed for the current item, select the part in the scrollable list and then click the **Supplier Details** button. Supplier information for the selected part will be displayed (in read-only mode).

To list the available supplier details for a different model item without returning to the General Maintenance form, enter the new item name and click the **Apply** button.

Isolation List

The Isolation List form, illustrated in *Figure A:7.: Isolation List Form*, allows you to view details of maintenance isolation lines that have been generated for a named model item.



Isolation List

Name	/C1101
Purchase Order	CTZ234
Description	Main Separation Tower

Name	Description
/150-B-6-B1	Separator feed line
/C1101-M3	Manhole
/C1101-M1	Manhole
/C1101-M2	Manhole
/C1101-N11	Sample point
/100-B-1-B1	Recycle line

Figure A:7. Isolation List Form

The scrollable list shows all associated items which make up the isolation line related to the current item. The complete isolation line will be highlighted in the Review display.

To list the isolation line details for a different model item without returning to the General Maintenance form, enter the new item name and click the **Apply** button.

A.8 Summary of the Application Data

As a guide to the data available within the example supplied, the following tables show the data which may be extracted by using the various applications.

A.8.1 Progress Monitoring

	Piping	**Mech.**	**Vessels**	**Civil**	**Structural**	**HVAC**	**Instr./ Elec.**
Preliminary	no	no	no	no	no	no	no
Final Design	yes	no	no	no	no	no	No
Fabricated	yes	n/a	n/a	n/a	no	no	Yes
Erected	yes	n/a	n/a	n/a	yes	no	Yes
Tested	yes	yes	yes	n/a	yes	no	No
Delivered	n/a	no	yes	n/a	n/a	n/a	n/a

	Piping	Mech.	Vessels	Civil	Structural	HVAC	Instr./ Elec.
Installed	n/a	no	yes	yes	n/a	n/a	n/a
Excavated	n/a	n/a	n/a	no	n/a	n/a	n/a
Foundations	n/a	n/a	n/a	no	n/a	n/a	n/a
Oversite	n/a	n/a	n/a	yes	n/a	n/a	n/a

A.8.2 Engineering Data

The engineering data extracted from the data source (flat file or database tables) is based on the following elements:

/C1101	Main Separator Tower
/P1502A	Secondary Backup Pump
/V-70	Manual Shutdown Valve

A.8.3 Maintenance

Vessels

	Overdue	Due today	Due next week	Due next month
Primary data	no	no	yes	yes
Schedule	no	no	yes	yes
History	no	no	yes	yes
Parts inventory	no	no	yes	yes
Isolation list	no	no	yes	yes

Exchangers

	Overdue	Due today	Due next week	Due next month
Primary data	no	no	no	yes
Schedule	no	no	no	no
History	no	no	no	no
Parts inventory	no	no	no	no
Isolation list	no	no	no	no

Mechanical

	Overdue	Due today	Due next week	Due next month
Primary data	yes	yes	yes	yes
Schedule	no	no	no	no
History	no	no	no	no
Parts inventory	no	no	no	no
Isolation list	no	no	no	no

Instruments

	Overdue	Due today	Due next week	Due next month
Primary data	no	no	no	yes
Schedule	no	no	no	no
History	no	no	no	no
Parts inventory	no	no	no	no
Isolation list	no	no	no	no

All

	Overdue	Due today	Due next week	Due next month
Primary data	yes	yes	yes	yes
Schedule	no	no	yes	yes
History	no	no	yes	yes
Parts inventory	no	no	yes	yes
Isolation list	no	no	yes	yes

Most of the data extracted from the data source (flat file or database tables) is based on the following elements:

/C1101	Main Separator Tower.
/P1502A	Secondary Backup Pump.
/V-70	Manual Shutdown Valve.
/E1301	Storage Tank.
V121	Manual Shutdown Valve

There are instances where data extracted is not consistent with that of the model. In such cases the following message will be displayed:

```
data ignored not in Review model
```

A.9 Application Files Supplied

For convenience, the sample application files are supplied under a function-related directory hierarchy, thus:

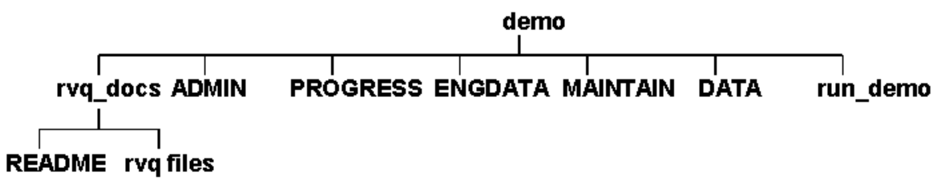


Figure A:8. Hierarchy of Supplied Application Files

These directories and files have the following functions:

ADMIN	A general directory for startup and initialisation of Query.
PROGRESS	A directory for the progress monitoring applications.
ENGDATA	A directory for the engineering data applications.
MAINTAIN	A directory for the maintenance applications.
DATA	A directory containing data for use by the applications.
run_demo	A script to run the Review demonstration application.

The names of many of the files begin with a prefix which indicates the file's function, thus:

F	Denotes a form definition.
M	Denotes a macro definition.
U	Denotes a utility macro.
I	Denotes a form initialisation macro.

All other filenames denote general files which are not specifically used in creating forms.

A.9.1 ADMIN Directory

File	Purpose
`CONFIG`	User-specified configuration; e.g. database server node
`FORACLE`	Form definition macro for RDBMS connection
`FSYSTEM`	Form definition macro for main system menu
`FVERSION`	Form definition macro for versions
`IORACLE`	Initialisation macro for RDBMS connection
`IVERSION`	Initialisation macro for versions
`MORACLE`	Result macro for RDBMS connection
`MVERSION`	Result macro for versions
`RPODESC`	Utility macro to set purchase order number and description
`START`	Query start-up macro
`UCAMERA`	Utility macro to set up camera 1
`UORACLE`	Utility macro to invoke RDBMS connection form
`UQUIT`	Utility macro to quit Query
`URESET`	Utility macro to reset observer materials
`UVIEWDOC`	Utility macro to view documents (plotfiles and other formats)
`VAR2ENV`	Utility macro to convert %Variable% to environmental variable

A.9.2 ENGDATA Directory

File	Purpose
`FENGDATA`	Form definition macro for engineering data.
`FPLOTVIEW`	Form definition macro for plotfile viewer.
`IENGDATA`	Initialisation macro for engineering data.
`MENGDATA`	Result macro for engineering data.
`UNEXTPLOT`	Utility macro to view next plot.
`UPREVPLOT`	Utility macro to view previous plot.

A.9.3 PROGRESS Directory

File	Purpose
FPROGRESS	Form definition macro for progress monitoring.
IPROGRESS	Initialisation macro for progress monitoring.
MPROGRESS	Result macro for progress monitoring.
UDISCIP	Utility macro to set status list for selected discipline.
UTRANSLU	Utility macro to make display translucent.

A.9.4 MAINTAIN Directory

File	Purpose
FHISTORY	Form definition macro for maintenance history.
FINVENT	Form definition macro for parts inventory.
FISOLATE	Form definition macro for isolation list.
FMAINTAIN	Form definition macro for maintenance requirements.
FSCHEDULE	Form definition macro for maintenance schedule.
FSUPPLY	Form definition macro for supplier details.
IHISTORY	Initialisation macro for maintenance history.
IINVENT	Initialisation macro for parts inventory.
IISOLATE	Initialisation macro for isolation list.
IMAINTAIN	Initialisation macro for maintenance requirements.
ISCHEDULE	Initialisation macro for maintenance schedule.
ISUPPLY	Initialisation macro for supplier details.
MHISTORY	Result macro for maintenance history.
MINVENT	Result macro for parts inventory.
MISOLATE	Result macro for isolation list.
MMAINTAIN	Result macro for maintenance requirements.
MSCHEDULE	Result macro for maintenance schedule.
UMSHOW	Utility macro to show and apply one of the maintenance forms.

A.9.5 DATA Directory

File	Purpose
DOCDATA	Document data for engineering application
NAMEDATA	Element names against description data
SUPPLIERDATA	Supplier data containing names, addresses and telephone No.
ISOLATEDATA	Isolation elements against primary element data
PARTSINVDATA	Parts inventory and supplier names against element data
MAINHDATA	Maintenance history data and reports against element data
MAINSDATA	Maintenance service data and reports against element data
MAINTDATA	Maintenance schedules and due dates against element data
PROGRESSDATA	Progress monitoring data type against completion state
oracle_data	An ORACLE data file in the form of tables for loading into ORACLE. Table contents and names are consistent with those of the above flat files.
sybase_data.ksh	A Shell script for loading demo tables into Sybase RDBMS. Table contents and names are consistent with those of the above flat files.
C1101.plot	Plotfile of 2D drawing of the Stabiliser
C1101020592.asc	Maintenance report
C1101091092.asc	Maintenance report
C1101111091.asc	Maintenance report
C1101121089.asc	Maintenance report
C1101141090.asc	Maintenance report
EI3245.plot	Electrical drawing plotfile
EI3246.plot	Electrical drawing plotfile
V-70.spec	Valve specification
P1501A.bom	Pump bill of materials
P1501A.plot	Plotfile of 2D drawing of Pump
cablelist..rep	Electrical cable list report (PEGS-generated)
panel.rep	Electrical panel report (PEGS-generated)
pfd.plot	Process flow diagram plotfile
pid1.plot	P&ID sheet 1
pid2.plot	P&ID sheet 2

File	Purpose
`pid3.plot`	P&ID sheet 3
`v-70.tif`	Scanned image of a valve (sectioned drawing)
`xtiff`	Utility to display scanned images

B PML 1 Expressions

This appendix explains the PML 1 expressions package. These facilities are needed within AVEVA products, for example, to define report templates in PDMS.

Note: Generally, all these facilities are compatible with PML 2.

Expressions have types. For example, you can have numeric expressions, text expressions and logical expressions. All the elements in an expression must be of the correct type. For example, if you have a two numbers, x and y, and two text strings text1 and text2, the following expression is meaningless:

```
x + text1            $
```

However, both of the following expressions are valid:

`x + y`	$ adds the values of the numeric variables.
`Text1 + text2`	$ concatenates the two text strings.

The following types of expressions are available:

Expression

Logical Expressions

Logical Array Expressions

Numeric (Real) Expressions

Real Arrays

Text Expressions

B.1 Format of Expressions

The format of an expression, for example the use of brackets, spaces and quotes, is important. If you do not follow the rules given below you will get error messages:

Text must be enclosed in quotes. For example:

```
 ‘This is text’
```

There must be a space between each operator and operand. For example:

```
x + y
```

Use round brackets to control the order of evaluation of expressions and to enclose the argument of a function. For example:

```
SIN(30)
```

In general, you do not need spaces before or after brackets, except when a name is followed by a bracket. If there is no space, the bracket will be read as part of the name. For example:

(NAME EQ /VESS1)

B.1.1 Operator Precedence

Operators are evaluated in the order of the following list: the ones at the top of the list are evaluated first.

Operator	**Comments**
BRACKETS	Brackets can be used to control the order in which operators are evaluated, in the same way as in normal arithmetic
FUNCTIONS	
* /	
+ -	
EQ, NEQ, LT, LE, GE, GT	
NOT	
AND	
OR	

B.1.2 Nesting Expressions

Expressions can be nested using brackets. For example:

```
( (SIN(!angleA) * 2)  /  SIN(!angleB) )
```

B.2 Logical Expressions

Logical expressions can contain:

- Attributes of type logical e.g. BUILT.
- Logical constants. The constants available are: TRUE, ON, YES for true, and FALSE, OFF, NO for false.

- Logical operators.
- Logical functions.

B.2.1 Logical Operators

The logical operators available are:

Operator	**Comments**
AND	
EQ, NE	The operators EQ and NE may be applied to any pair of values of the same type.
GT, GE, LE, LT	The operators GE, LE, GT and LT may only be used with numbers and positions. For more information, see Section C.5, ***Using Positions, Directions and Orientations in Expressions***.
NOT	
OR	

Note: The operators EQ, NE, LT, GT, LE and GE are sometimes referred to as ***comparator*** or ***relational*** operators; NOT, AND and OR are sometimes referred to as ***Boolean*** operators. See also *Section C.11, Precisions of Comparisons* for tolerances in comparing numbers.

AND

Synopsis	`log1 AND log2                  -> logical`
Description	Perform the logical AND between two logical values. Treats unset values as FALSE.
Side Effects	If one of the values is undefined and the other one is FALSE, the result is FALSE.
Example	`TRUE and FALSE -> FALSE`

EQ and NE

Synopsis

```
( number1 EQual number2)     -> logical
( text1 EQual text2 )        -> logical
( log1 EQual log2 )          -> logical
( id1 EQual id2 )            -> logical
( pos1 EQual pos2 )          -> logical
( dir1 EQual dir2 )          -> logical
( ori1 EQual ori2 )          -> logical
( pp1 EQual pp2 )            -> logical
( number1 NEqual number2 )   -> logical
( text1 NEqual text2 )       -> logical
( log1 NEqual log2 )         -> logical
( id1 NEqual id2 )           -> logical
( pos1 NEqual pos2 )         -> logical
( dir1 NEqual dir2 )         -> logical
( ori1 NEqual ori2 )         -> logical
( pp1 NEqual pp2 )           -> logical
```

Description

Compare two values. A special feature is used for the positions, only the coordinates specified are compared. See *Section C.5.4* for more information. Unset values result in FALSE across EQ, TRUE across NE.

Side Effects

If two positions have no common coordinate, for example, `'N 10 ne U 10'`, the result is undefined. Units are consolidated across comparisons.

Example

```
( 1.0 eq 2.0) -> FALSE
```

Errors

None.

GT, GE, LE and LT

Synopsis

```
( number1 GT number2 )       > logical
( pos1 GT pos2 )             > logical
( number1 GE number2 )       > logical
( pos1 GE pos2 )             > logical
( number1 LE number2 )       > logical
( pos1 LE pos2 )             > logical
( number1 LT number2 )       > logical
( pos1 LT pos2 )             > logical
```

Description

Compare two values. A special feature is used for positions: only the coordinates specified are compared. See Section C.5.4 for more information. For positions, since comparisons may be performed on more than one value, LT (GT) is not the inverse of GE (LE). Unset values result in false

Side Effects

If two positions have no common coordinate, the result is undefined. For example, `'N 10 gt U 10`'.

Units are consolidated across comparisons.

Example

```
( 1.0 LT 2.0) -> TRUE
( N 0 E 10 GT N 10 E 0 ) -> FALSE
( N 0 E 10 GT N 10 E 0 )  -FALSE
```

Errors

None.

NOT

Synopsis

```
NOT log1                    -> logical
```

Description

Perform the logical NOT on a logical value.

Side Effects

None.

Example

```
not TRUE -> FALSE
```

Errors

None.

OR

Synopsis	`OR log2                    -> logical`
Description	Perform the logical inclusive OR between two logical values. (The exclusive OR is defined by using NE.) Allows numbers instead of logical values.
Side Effects	If one of the values is undefined and the other one is TRUE, the result is TRUE.
Example	`TRUE or FALSE -> TRUE`
Errors	None.

B.2.2 Logical Functions

The logical functions available are:

Function	Comments
BADREF	
DEFINED,UNDEFINED	
CREATED	
DELETED	
EMPTY	
MATCHWILD	
MODIFIED	
UNSET	
VLOGICAL	

BADREF

Synopsis	`BADREF (id)                -> logical`
Description	TRUE if **id** is invalid, else FALSE.
Side Effects	None
Example	`BADREF(TREF)  ->  'true' if TREF=nulref`
Errors	None.

DEFINED and UNDEFINED

Synopsis	`DEFined (variable_name)`	`-> logical`
	`DEFined (variable_name,number)`	`-> logical`
	`UNDEFined (variable_name)`	`-> logical`
	`UNDEFined (variable_name , number)`	`-> logical`

Description

With one argument, DEFINED is true only if the scalar variable, the array variable or the array variable element exists.

With two arguments, DEFINED is true only if the first argument is an array variable which has a value for the index denoted by the second argument.

`UNDEFINED( !foo ) is equivalent to NOT DEFINED( !foo ).`

Side Effects

None.

Example

```
DEFINED ( !var ) -> TRUE
DEFINED ( !array ) -> TRUE
DEFINED ( !array[1] )) -> TRUE
DEFINED ( !array , 1 ) -> TRUE
DEFINED ( !var) -> FALSE
UNDEFINED ( !array) -> TRUE
DEFINED ( !array , 3 ) -> FALSE
```

Errors

None.

CREATED

Synopsis

`CREATED                     -> logical`

Description

Returns TRUE if the element has been created since the set date.

Side Effects

None.

Example

`CREATED -> TRUE`

Errors

None.

DELETED

Synopsis	`DELETED                   -> logical`
Description	Returns TRUE if the element has been deleted since the set date.
Side Effects	None.
Example	`DELETED -> TRUE`
Errors	None.

EMPTY

Synopsis	`EMPTY(text)                -> logical`
Description	Returns TRUE if text is a zero length string, else FALSE
Side Effects	None.

Example	`EMPTY(‘’) -> TRUE`
	`EMPTY(‘not empty’) -> FALSE`

Errors	None.

MATCHWILD

Synopsis	`MATCHW/ILD( text1, text2)    -> logical`
	`MATCHW/ILD( text1, text2, text3)    -> logical`
	`MATCHW/ILD( text1, text2, text3, text4)    -> logical`

Description	Matches string **text2** to string **text1**. If they are the same then returns TRUE, else FALSE. **text2** may contain wildcard characters. The defaults for wildcards are ‘*’ for any number of characters, and ‘?’ for a single character. With three arguments, the multiple wildcard character ‘*’ may be redefined by **text3**. With four arguments the single wildcard character ‘?’ may be redefined by **text4**.
Side Effects	None

Example

```
MATCHW/ILD('A big bottle of
beer','*big*') -> TRUE
MATCHW/ILD('A big bottle of
beer','??big*') -> TRUE
MATCHW/ILD('A big bottle of
beer','???*big*') -> FALSE
MATCHW/ILD('A big bottle of
beer','*big*beer') -> TRUE
MATCHW/ILD('** text','**!','!') -> TRUE
```

Errors

None.

MODIFIED

Synopsis

```
                                 .------------------------------------.
                                /                                     |
>- MODIFIED-(-+- attname -------*- DESCENDANTS --+-+-comma +-attname -'
              |                 |                | |
              |- DESCENDANTS -. |- SIGNIFICANT --| |
              |               | |                | |
              |- SIGNIFICANT--| |- PRIMARY ----- | |
              |               | |                | |
              |- PRIMARY -----| |- OFFSPRING-----| |
              |               | |                | |
              |- OFFSPRING ---| '----------------' |
              |               |                    |
              |               |                    |
              |               |                    |
              '---------------+--------------------+--+-- ) - OF - id
                                                      |
                                                      '-
```

Description

For sophisticated queries relating to modifications. Returns TRUE if a modification has taken place.

Each attribute name may be followed by the following qualifying keywords:

OFFSPRING, to check this element and members

SIGNIF, to check all elements for which this element represents the significant one;

PRIMARY, check all elements for which this element represents the primary one;

DESCENDANTS, this element and everything below (descendants).

The 'OF' syntax may be used as for attributes.

The MODIFIED function or the GEOM, CATTEXT and CATMOD pseudo-attributes can be used instead of the AFTERDATE function. Refer to the *Data Model Reference Manual*.

	The MODIFIED, DELETED and CREATED functions may go anywhere within a PML1 expression. i.e. after Q/VAR and within collections	
Side Effects	None	
Example	`Q MODIFIED()`	Returns TRUE if element has changed at all since the comparison date. It will also return TRUE if the element has been created since the comparison date.
	`Q MODIFIED(POS,ORI)`	Returns TRUE if POS or ORI modified since the comparison date.
	`Q MODIFIED(P1 POS)`	Returns TRUE if the position of P1 has changed.
	`Q MODIFIED(GEOM DESCENDANTS`	Returns TRUE if any geometry for item or any descendants has changed
	`Q MODIFIED(PRIMARY)`	Returns TRUE if any element for which this element is primary, has changed.
	`Q MODIFIED() OF /PIPE1`	Returns TRUE if /PIPE1 has been modified since the comparison date.
	`Q (BUIL OR MODIFIED()OR ELECREC OF NEXT )`	
Errors	None.	

The MODIFIED, DELETED and CREATED functions are not implemented within PML2 expressions.

UNSET

Synopsis	`UNSET(value)          -> logical`
Description	Returns TRUE if **value** is unset, else FALSE. The value can be of any data type including ARRAYS. Normally it will be a attribute.
Side Effects	None.

Example	`UNSET( DESC )`	TRUE where **DESC** is an unset text attribute
	`UNSET(CRFA)`	FALSE where **CRFA** contains unset reference attributes
Errors	None.	

VLOGICAL

VLOGICAL is used for the late evaluation of variables.

Synopsis

```
VLOGICAL ( variable_name ))    -> logical
VLOGICAL ( variable_name ,     -> logical
number)
```

Description

With one argument, return the value of the scalar variable or the value of the array variable element as a logical.

With two arguments, return the value of the element corresponding to the index number as a logical.

The rules of conversion are:

TRUE for the strings ’T’, ’TR’, ’TRU’ or ’TRUE’ (case insensitive) or any numeric value not equal to zero;

FALSE for the strings ’F’, ’FA’, ’FAL’, ’FALS’ or ’FALSE’ (case insensitive) or a numeric value equal to zero.

Scalar variables may not be indexed. For example, `VTEXT(!var[1])` will return an error.

Array variables must have an index. For example, `VTEXT (!array)` will return an error.

The value cannot be translated into a logical.

See also VTEXT, used for late evaluation when a text result is required; and VVALUE, used for late evaluation when a numeric result is required.

Side Effects

If the scalar variable, the array variable, or the array variable element does not exist, the result is undefined.

Example

```
VLOG ( !array[1] )  -> TRUE
VLOG ( !array , 2 ) -> FALSE
```

Errors

None.

B.2.3 Logical Array Expressions

Logical array expressions can contain:

- PDMS attributes of type logical array. For example, LOGARR where LOGARR is a UDA of type logical.

- Logical constants. The constants available are: TRUE, ON, YES for true; and FALSE, OFF, NO for false.
- Logical operators. See *Logical Operators.*
- Logical functions. See *Logical Functions.*

B.3 Numeric (Real) Expressions

In expressions, integers are treated as reals; they are fully interchangeable. Numeric expressions can contain:

- Numbers, for example: 32, 10.1.
- Numbers can be given as as integer exponents, for example: 10 exp 5, and 5 E 6.
- Numbers can contain units. The valid units are MM, M/ETRES, IN/CHES, and FT, FEET. These may be preceded by SQU/ARE, CUBIC, CUB/E to denote non-linear values. For example: 100mm, 10 exp 5 cubic feet. Feet and inches can be shown as, for example, 10'6:
- Attributes of type number, for example: XLEN.
- Position, direction and orientation attributes which have a subscript to indicate which part of the array is required. For example, `POS[2]` means the second element of the POSITION attribute; that is, the northing. Note that position, direction and orientation attributes without subscripts can only be used in number array expressions.
- The keyword PI (3.142).
- Numeric operators.
- Numeric functions.

B.3.1 Numeric (Real) Operators

The numeric operators available are:

Operator	**Comments**
+	Addition.
-	Subtraction.
*	Multiplication.
/	Division.

B.3.2 ADD and SUBTRACT (+ and -)"

Synopsis	`number + number`	`-> number`
	`number - number`	`-> number`
	`+ number`	`-> number`
	`- number`	`-> number`

Description	Add or subtract two numbers. They can also be used as unary operators at the beginning of a parenthesised sub-expression.
Side Effects	Units are consolidated across add and subtract.

Example	`1 + 2 -> 3.0`
	`1 - 2 -> 1.0`
	`+ 1 -> 1.0`
	`- 1 -> -1.0`

Errors	Floating point underflow.

B.3.3 MULTIPLY and DIVIDE (* and /)

Synopsis	`number * number          -> number`
	`number / number          -> number`

Description	Multiply or divide two numbers. They can also be used as unary operators at the beginning of a parenthesised sub-expression. Numeric underflow is not considered to be an error and neither is it flagged as a warning. The result returned is zero.
Side Effects	Units are consolidated across Multiply and Divide.

Example	`2 * 3 -> 6.0`
	`2 / 3 -> 0.666666666`

Errors	Divide by zero.

B.3.4 Numeric (Real) Functions

The numeric functions available are:

Function	**Comments**
`ABS ( number1 )`	Gives the absolute value of a number
`ACOS ( number1 )`	Gives the arc cosine of a number, in degrees.
`ASIN ( number1 )`	Gives the arc sine of a number, in degrees.
`ATAN ( number1 )`	Gives the arc tangent of a number, in degrees.
`ATANT ( number1, number2 )`	Gives the arc tangent of **number1**/**number2**, in degrees, with the appropriate sign.
`ALOG ( number1 )`	Gives the exponential function (natural anti-log) of a number.

Function	Comments
`ARRAY(pos` ***or*** `dir` ***or*** `ori)`	Converts a position, direction or orientation value or attribute into three numbers.
`ARRAYSIZE ( variable-name )`	Gives the size of an array variable.
`ARRAYWIDTH( variable-name )`	Gives the largest display width of any string in array variable-name.
`COMPONENT dir OF pos2`	Gives the magnitude of a vector drawn from E0 N0 U0 to `pos2`, projected in the direction **dir1**.
`INT ( number1 )`	Gives the truncated integer value of a number.
`SIN ( number1 )`	Gives the sine, cosine or tangent value of a number (considered to be in degrees).
`COS ( number1 )`	Gives the sine, cosine or tangent value of a number (considered to be in degrees).
`TAN ( number1 )`	Gives the sine, cosine or tangent value of a number (considered to be in degrees).
`LENGTH ( text1 )`	Gives the length of text1.
`DLENGTH ( text1 )`	Gives the length of **text1**. DLENGTH is used with characters which have a displayed width that is different from standard characters, such as Japanese.
`LOG ( number1 )`	Gives the natural logarithm of a number.
`MATCH ( text1, text2 )`	Gives the position of the beginning of the leftmost occurrence of **text2** in `text1`. If **text2** does not occur in **text1**, 0 is returned.
`DMATCH ( text1, text2 )`	Gives the position of the beginning of the leftmost occurrence of **text2** in `text1`. If **text2** does not occur in **text1**, 0 is returned. DMATCH is used with characters which have a displayed width that is different from standard characters, such as Japanese.
`MAX ( number1, number2[ , number3 [. . .]]) )`	Gives the maximum value of the arguments.
`MIN ( number1, number2[ , number3 [. . .]]) )`	Gives the minimum value of the arguments.
`NEGATE`	Multiply a number by -1.0.
`NINT ( number1 )`	Gives the nearest integer to a real. NINT(N+0.5) is equal to N+1 if N is positive or equal to zero, to N if N is negative.
`OCCUR ( text1, text2 )`	Gives the number of times string **text2** occurs in string **text1**.
`REAL ( text1 )`	Try to read a number at the beginning of **text1**.

Function	**Comments**
`POWER ( number1, number2 )`	Gives the value of **number1** raised to the power **number2**.
`SQRT ( number1 )`	Gives the square root of a number.
`VVALUE ( variable-name )`	Used for late evaluation of variables. Gives a real value.

ABS

Synopsis	`ABS ( number1 )`	`-> number`
Description	Returns the absolute value of a real.	
Side Effects	None.	
Example	`ABS ( -3.2 ) -> 3.2`	
Errors	None.	

ACOS, ASIN, ATAN and ATANT

Synopsis	`ASIN ( number1 )`	`-> number`
	`ACOS ( number1 )`	`-> number`
	`ATAN ( number1 )`	`-> number`
	`ATANT ( number1, number2 )`	`-> number`
Description	Return the arc-cosine, arc-sine or arc-tangent of a number, in degrees. ATANT returns the arc-tangent of `number1/number2` with the appropriate sign. ATANT is useful where the second value is near or equal to zero. For example, (6 0 ATANT) will give the correct result of 90 degrees, but (6 0 D ATAN) will indicate an error when trying to divide by zero.	
Side Effects	None.	
Example	`ACOS ( 0.8660254 ) -> 30`	
Errors	Argument of ACOS or ASIN out of range [-1.0,+1.0] `ATANT (0.0,0.0)` is undefined.	

ALOG

Synopsis	`ALOG ( number1 )              -> number`
Description	Return the exponential function (natural anti-log) of a number.
Side Effects	Numeric underflow causes the result to be set to zero.
Example	`ALOG( -0.7 ) -> 0.4965853`
Errors	Floating point overflow.

ARRAY

Synopsis	`ARRAY(pos` ***`or`*** `dir` ***`or`*** `ori)     -> number`
Description	Converts a position, direction or orientation value or attribute into three numbers.
Side Effects	None
Example	`ARRAY(e100 )  -> 100  0  0`
Errors	None.

ARRAYSIZE

Synopsis	`ARRAYSize ( variable-name )   -> number`
Description	Give the size of an array variable.
Side Effects	If the array variable does not exist, the result is undefined.
Example	`ARRAYSIZE(!array)  -> 2.0`
Errors	The variable is a scalar variable and not an array variable.
	The variable is an array variable element and not an array variable.

ARRAYWIDTH

Synopsis	`ARRAYWIDTH ( variable-name )   -> number`
Description	Give the largest display with of any string in array **variable_name**.
Side Effects	None.

Example If an array contains the following values:

```
!ARRAY[1]      'Bread'
!ARRAY[2]      'is'
!ARRAY[3]      'for'
!ARRAY[4]      'life,'
!ARRAY[5]      'not'
!ARRAY[6]      'just'
!ARRAY[7]      'for'
!ARRAY[8]      'breakfast'
```

Then

```
ARRAYWIDTH(!ARRAY -> 9
```

i.e. the length of 'breakfast'.

Errors The variable is a scalar variable and not an array variable.

The variable is an array variable element and not an array variable.

COMPONENT ... OF ...

Synopsis

```
COMPonent dir1 OF pos2        -> text
```

Description Returns the magnitude of a vector drawn from E0 N0 U0 to **pos2**, projected in the direction **dir1.**

Side Effects None.

Example

```
COMP E 45 N of N 0 E 100 U 50 -> 70.710
```

Errors None.

SINE, COSINE and TANGENT

Synopsis

```
SINe ( number1 )              -> number
COSine ( number1 )            -> number
TANgent ( number1 )           -> number
```

Description Return the sine, cosine or tangent value of a number (considered to be in degrees).

Side Effects None.

Example

```
COS ( 0.0 )  -> 1.0
TAN ( 45.0 )  -> 1.0
```

Errors Division by zero for TAN if the sine is (nearly) equal to zero.

INT

Synopsis	`INT ( number1 )                    -> number`
Description	Return the truncated integer value of a number.
Side Effects	None.

Example	`INT ( 1.6 )    -> 1.0`
	`INT ( -23.7 )   -> -23.0`

Errors	Integer overflow.

LENGTH and DLENGTH

Synopsis	`LENgth ( text1 )                 -> number`
	`DLENgth ( text1 )                -> number`

Description	Return the length of **text1**. DLENGTH is for use with characters which have a displayed width that is different from standard characters, such as Japanese.
Side Effects	None.

Example	`LENGTH ( ’abcdef’ )  -> 6.0`
	`LENGTH ( ’’ ) -> 0.0`

Errors	None.

ALOG

Synopsis	`LOG ( number1 )                  -> number`
Description	Return the natural logarithm of a number..
Side Effects	None.
Example	`LOG( 3 ) -> 1 0986123`
Errors	Negative arguments.

MATCH and DMATCH

Synopsis	`MATch ( text1 , text2)        -> number`
	`DMATch ( text1 , text2)       -> number`

Description	Return the position of the beginning of the leftmost occurrence of **text2** in **text1**. If **text2** does not occur in **text1**, 0 is returned DMATCH is for use with characters which have a displayed width that is different from standard characters, such as Japanese.
Side Effects	None.

Example	`MATCH ( ’abcdef’ , ’cd’ ) -> 3.0`
	`MATCH ( ’abcdef’ , ’x’ ) -> 0.0`
	`MATCH ( ’abcdef’ , ’’ ) -> 1.0`

Errors	None.

MAX and MIN

Synopsis	`MAX ( number1 , number2 [ , number3 [ ... ] ] )  -> number`
	`MIN ( number1 , number2 [ , number3 [ ... ] ] )  -> number`

Description	Return the maximum or minimum value of the arguments.
Side Effects	None.

Example	`MAX ( 1 , 3.4 )         -> 3.4`
	`MIN ( 7.6 , -12.33 , 2.3 )  -> -12.33`

Errors	None.

NEGATE

Synopsis	`NEGate ( number1 )           -> number`
Description	Multiply a real by -1.0.
Side Effects	None.
Example	`NEG ( 1 ) -> -1.0`
Errors	None.

NINT

Synopsis	`NINT ( number1 )                -> number`
Description	Return the nearest integer to a real. `NINT(N+0.5)` is equal to `N+1` if **N** is positive or equal to zero, to **N** if **N** is negative.
Side Effects	None.

Example	`NINT ( 1.1 )    -> 1.0`
	`NINT ( -23.7 )  -> -24.0`
	`NINT ( 1.5 )    -> 2.0`
	`NINT ( -11.5 )  -> -12.0`

Errors	Integer overflow.

OCCUR

Synopsis	OCCUR(text1, text2) `-> integer`
Description	Counts the number of times string **text2** occurs in string **text1**
Side Effects	None.

Example	`OCCUR ('ABBACCBBBBBAB', 'BB')  -> 3`
	`OCCUR('ZZZZZZZZZZZ', 'A')  -> 0`

Errors	None..

REAL

Synopsis	`REAL ( text1 )                -> number`
Description	Try to read a real number at the beginning of **text1**. Note that if text is in the form of an exponent, (-12E-1 in the third example), there must be no spaces in it. Note: this function was formerly called NUMBER.
Side Effects	Numeric underflow causes the result to be set to zero. Units are consolidated across POWER.

Example	`REAL ( '12.34') -> 12.34`
	`REAL ( ' 7.23 E 3 meters' )  -> 7.23`
	`REAL ( ' -12E-1 meters ' )  -> -1.2`

Errors	Unable to convert the text into a real number.

POWER

Synopsis	`POWer ( number1 , number2 )   -> real`
Description	Return the value of **number1** raised to the power **number2**.
Side Effects	None.
Example	`POWER ( -2 , 3 ) -> -8`
Errors	Floating point overflow. Zero first argument and non-positive second argument (effectively divide by zero). Negative first argument and non-integer second argument.

SQRT

Synopsis	`SQrt ( number1 )            -> number`
Description	Return the square root of a real.
Side Effects	Units are consolidated across SQRT.
Example	`SQRT ( 4 ) -> 2.0`
Errors	Negative argument.

VVALUE

VVALUE is used for the late evaluation of variables.

Synopsis	`VVALue( variable_name )      -> number`
	`VVALue( variable_name , number )      -> number`

Description	With one argument, returns value of the scalar variable or value of the array variable element as a number. With two arguments, returns value of the element corresponding to the index number as a number. See also VLOGICAL, used for late evaluation when a logical result is required, and VTEXT, used for late evaluation when a text result is required.
Side Effects	If the scalar variable, the array variable or the array variable element does not exist, the result is undefined.

Example	`VVAL ( !array[1] ) -> 1.0`
	`VVAL ( !array , 2 ) -> 0.0`

Errors	Scalar variable may not be indexed. For example, VTEXT `(!var[1])`) will return an error. Array variable must have an index. For example, VTEXT `( !array )`) will return an error. The string can not be converted to a number.

B.3.5 Real Arrays

Real array expressions can contain attributes of type real array, for example: DESP.

B.4 Using IDs in Expressions

IDs can be used in expressions. IDs can be any of the following:

- Element name, for example: /VESS1.
- Refno, for example: =23/456.
- Element type further up the hierarchy, for example: SITE.
- Number within member list, for example: 3.
- Type and number within member list, for example: BOX 3.
- NEXT, PREV for next, previous within current list. Optionally with a count and/or element type, for example: NEXT 2 BOX, LAST CYL.
- NEXT, PREV MEMBER for next, previous within member list. Optionally with a count and/or element type.
- If the element type given is only valid as a member then MEMBER is assumed. For example, NEXT BOX at an EQUIPMENT will assume MEMBER.
- FIRST, LAST for first and last in current list. Optionally with a count and/or element type.
- FIRST, LAST MEMBER for first and last in member list. If the element type given is only valid as a member then MEMBER is assumed.
- END to navigate up from current list.
- END is similar to owner but not quite the same. For example, if the current element is a GROUP MEMBER, and it has been reached from the GROUP then END will return to the group but OWNE will go to the true owner.
- Attribute of type ref, for example: CREF
- SAME to mean last current element
- NULREF to mean =0/0
- CE for the current element
- 'OF' may be used to nest the options indefinitely. For example:

  ```
  SPEC OF SPREF OF FLAN 1 OF NEXT BRAN.
  ```

- This denotes the SPEC element owing the SELE element pointed to by the SPREF attribute on the first FLANGE of the next BRANCH. ILEAVE TUBE, IARRIV TUBE, HEAD TUBE, TAIL TUBE can be added to denote tube. For example:

  ```
  HEAD TUBE OF /BRAN1.
  ```

- An error will occur if there is no implied tube for the element concerned.
  ID arrays can also be used in expressions. For example, CRFA.

Note: Some of the ID syntax clashes with other types. To allow for this, an id expression may always be preceded with the keyword ID. For example, ID 3 will mean the third member of the current list rather than a number of value 3.

B.5 Positions, Directions and Orientations in Expressions (PDMS only)

B.5.1 Using Positions in Expressions

The basic ways of defining a position are:

- Position attribute plus optional WRT. For example:

```
POS OF /VESS1 WRT /* or P1 POS OF /CYL2
```

- Cartesian position. For example:

```
N 45 W 20000 U 1000
```

- Cartesian position from an element. For example:

```
N 1000 FROM /ATEST.
```

- Cartesian position from a ppoint. For example:

```
N 1000 FROM P1 OF /BOX2.
```

- Cartesian position from an attribute. For example:

```
N 1000 FROM POSS OF /SCTN1
```

- Any numeric value within a position may itself be an expression. For example: the following is a valid position expression

```
N (DESP[1] + 10) E
```

The Cartesian position may optionally be followed by WRT to specify the axis system. See *WRT (PDMS Only)*.

B.5.2 WRT (PDMS Only)

The WRT keyword is used to toggle between absolute and relative units.

When we specify an element (or attribute of an element) we are specifying an absolute point in world space. The point can be given in world space or some other axis. Normally the answer is required relative to the owner axis system and this is taken as the default. For example:

`Q POS`	$ will return the position of the current element
	$ relatively to its owner.
`Q POS OF /EQUIP1`	$ will return the position of EQUIP1 relative to its
	$ owner.

If we require the result in some other axis system then the WRT keyword is used. For example:

`Q POS WRT /*`	$.for the position in world coordinates.

When we specify a Cartesian coordinate we are dealing with a relative position.

For example, 'N 10' is meaningless until we specify the axis system, or default to an axis system.

Again we use WRT to do this, although it is important to note that in this case we are going from a relative position to an absolute position (in the previous example WRT was used to go from an absolute position to a relative one).

For example:

`N 100 WRT /BOX1`	$ specifies an absolute position in world space
	$ which is N100 of /BOX1.

The default is that Cartesian coordinates are in the owning element's axis system. This absolute position can be expressed in different coordinate systems: the default is again the owner's axis system.

Note: The CONSTRUCT syntax uses the world as the default axis

Example

Item	Comments
A SITE at (0,0,0)	With default (World) orientation
A ZONE at (100,0,0)	With default (World) orientation
An EQUIPMENT at (100,0,0)	With orientation 'N IS E
A BOX at (-100,0,0)	With default (World) orientation

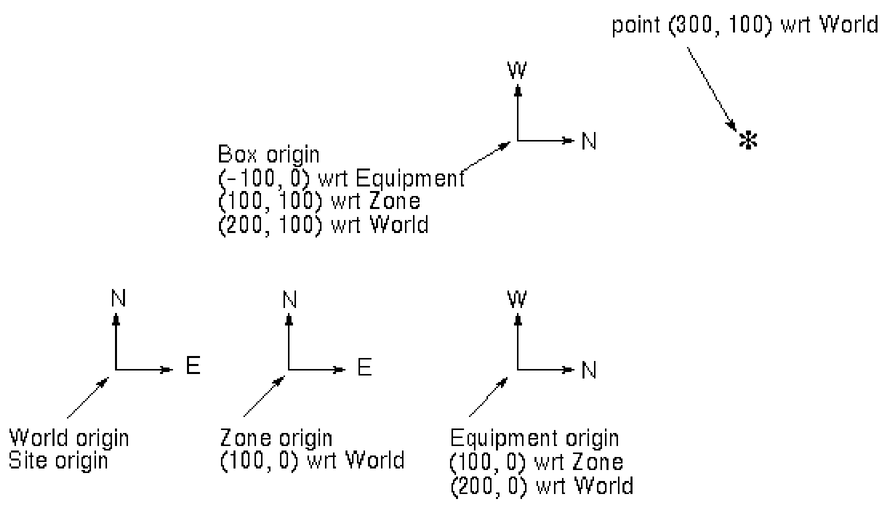


Figure B:1. Results of WRT

The result of `Q (N 100 WRT /BOX1)`, shown as ⊗ in , will depend on the current element.

Location	Result
World	(300,100,0), in World coordinates.
Site	(300,100,0) in World coordinates because the World is the owner of the current element.
Zone	(300,100,0) in World coordinates, because the Site is the owner of the current element, and the Site coordinates are the same as the World coordinates.
Equipment	(200,100,0), which is the position relative to its owner, the Zone.
Box	(100,100,0) which is the position relative to its owner, the Equipment.

WRT can be further qualified by FROM.

B.5.3 FROM

In some cases we require an offset from a fixed point, other than the position of an item. For example, a point or attribute.

The FROM syntax is used for this. We may still use WRT in combination with FROM, but in this case the WRT is only used to determine the axis direction and not the offset, since the offset is specified by the FROM part.

Consider the following:

Item	Comments
A SITE at (0,0,0)	With default (World) orientation
A ZONE at (100,0,0)	With default (World) orientation
An EQUIPMENT at (100,0,0)	With orientation ’N IS E
A BOX at (-100,0,0)	With default (World) orientation

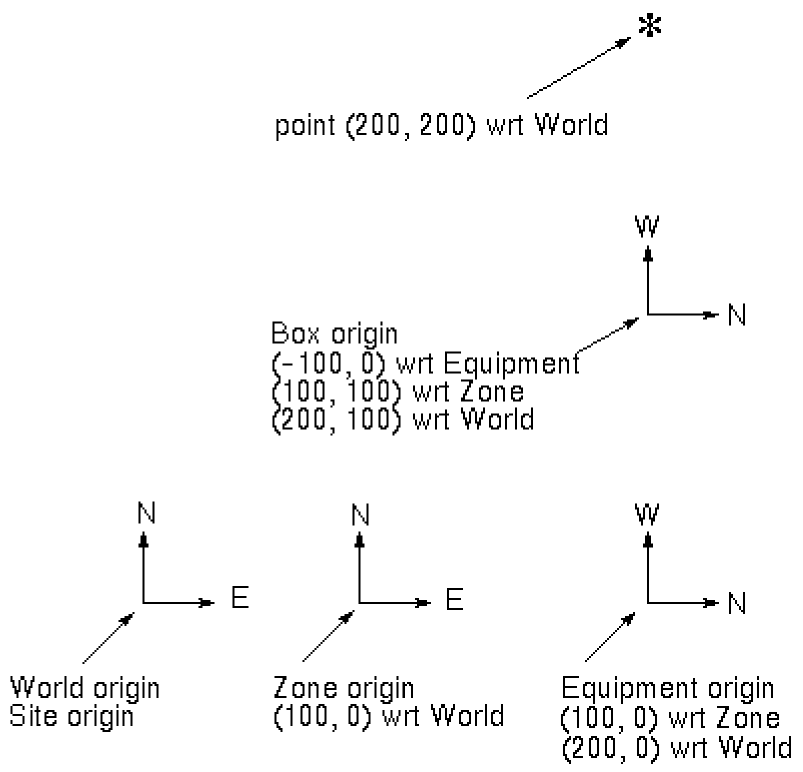


Figure B:2. The Effect of FROM

The result of `Q (N 100 WRT /* FROM /BOX1)`, shown as ⊗ in , will depend on the current element.

Location	**Result**
World, Site, and Zone	(200,200,0) since the offset of N100 is applied in world axis rather than /BOX1 axis.
Equipment	(100,200,0). **Note:** The default axis for the result is the Zone.
Box	(200,0,0), because the default axis for the result is the Equipment.

The result of `'Q (N 100 WRT /BOX1 FROM /* )` is different:

Location	**Result**
Site and Zone	(100,0,0)
Equipment	(0,0,0)
Box	(0, -100, 0), because the axis for the result is the Equipment.

The result of `'Q (N 100 FROM /* )'` is different yet again.

For this we cannot mark an absolute point on the diagram since the default WRT will vary with the current element. In fact for the SITE, ZONE, EQUI the point ⊗ is marked in , and for the BOX the point coincides with the ZONE.

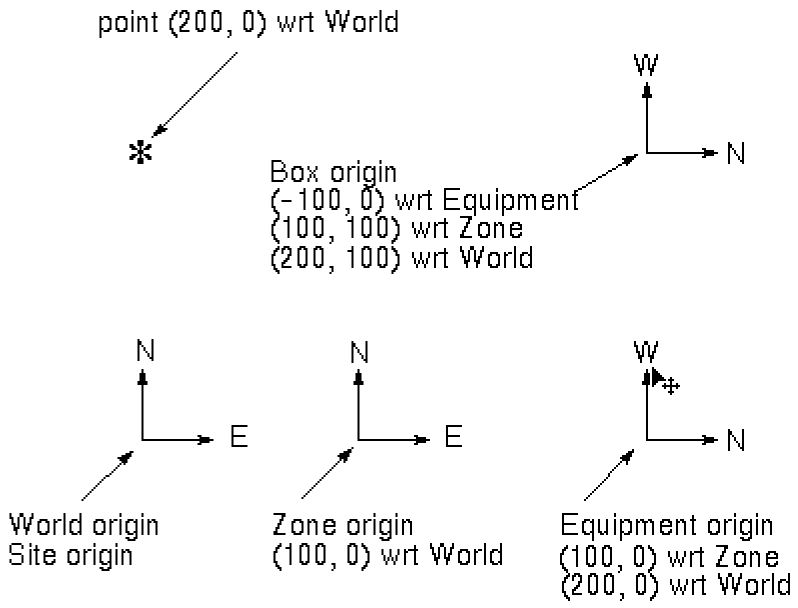


Figure B:3. Varying WRT

Location	**Result**
Site and Zone	(0,100,0)
Equipment	(-100,100,0), because the default result axis is the Zone.
Box	(0, -100, 0), because the axis for the result is the Equipment.

B.5.4 Comparing Positions

Two positions can be compared with EQ, NE, GT, LT, GE or LE. The pairs of coordinates are only compared in the coordinate axes for which the two positions are defined. A position attribute always has all three coordinates defined.

For positions entered by the user, only those coordinates which are given by the user are defined. For example:

`'N10U3'`	$ only the Y and Z coordinates are defined,
	$ while the X coordinate remains undefined

For the EQ operator, all the pairs of defined coordinates should be equal. For NE, only one pair of defined coordinates need be different. For GT (LT,GE,LE), all the defined coordinates of the first position should be greater than (less than, greater than or equal to, less than or equal to) the defined coordinates of the second position. This means that GE is not the opposite of LT and LE is not the opposite of GT.

If no coordinate of the two positions are defined for a common axis (e.g. ’N10’ and ’W4D7’), the result of the comparison is undefined.

Examples

`’POS EQ W1S2D3’`	$ This evaluates to true only if POS of the current $ element is (-1,-2,-3).
`’POS GT N10’ or ’N10 LE POS’`	$ Only the second coordinate of POS is compared; $ if it is greater than 10, then the result is true.

`’E10N10 GT E0N0’`	$ Is true because the inequality is verified for the X
	$ and Y axis (both coordinates are undefined for
	$ the Z axis, so it is ignored).

`’E10N0 GT E0N0’`	$ Is false because the Y components are different $ axes.

`’E10N0 GT E0U100’`	$ Is true. Although no comparison can be
	$ performed n either the Y or the Z axis, because
	$ the components are not present in both position
	$ constants, the comparison is true in the X
	$ component.

`’N10 EQ W4D7’`	$ Is undefined (no comparison is possible).

See also *Precision of Comparisons*, for tolerances in comparing numbers.

B.5.5 POLAR

The POLAR keyword allows positions to be defined in terms of a distance in a particular direction from a point.

The syntax is:

```
POLAR dir DISTance expr -+- FROM -+- pos -----.
                         |        |           |
                         |        ‘- point ---|
                         |                    |
                         ‘--------------------+--->
```

If FROM is not specified the default is the origin of the owner.

For example:

```
POLAR N 45 E DIST 20M FROM U 10 M

POLAR AXES PL OF PREV DIST ( ABORE * 10 ) FROM PL OF PRE V
```

B.5.6 Direction

The basic ways of defining a direction are:

- Direction attribute plus optional WRT. For example,

```
HDIR OF /PIPE1 WRT /*
```

- Cartesian direction. For example,

```
N 45 W
```

- Cartesian direction WRT to an element.
- All Cartesian directions are returned in the axis of the owner of the current element. For example:

```
(U WRT CE )
```

- will return the Z axis of the current element relative to its owner.

```
Q ( Z WRT /SCTN )
```

- will return the Z axis direction of /SCTN relative to the owner of the current element. For example, if the result is required in world coordinates the current element must be the World or a Site.
- FROM pos2 TO pos2. For example

```
FROM N 50 WRT CE TO N 100
```

- Keyword AXES followed by a p-point or pline.
- The CLOSEST keyword, which will find the closest element in a particular direction. The syntax is:

```
>- CLOSEST type -+- WITH exp -.
                 |            |
                 ‘------------+- DIRECTION dir -+- EXTENT val -.
                                                |              |
                                                ‘--------------+--> cont

          continued >-+- AFTER val -.
                      |             |
                      ‘-------------+- FROM ? -.
                                    |          |
                                    ‘----------+-->
```

- In the above graph the keywords are:
- EXTENT, which is how far to search in the direction specified, default 10M
- AFTER, or the distance along vector after which to start search, default 0M
- FROM, which specifies an alternative start point other than current element. This is of particular use for a branch where you might want to specify the HPOS or TPOS.
- Examples are:

```
CLOSEST DIR E

CLOSEST BOX WITH ( PURP EQ ’FLOO’ ) DIR D WRT /
* EXTENT 20M

CLOSEST VALVE DIR N 45 U FROM E100 N200 U300

CLOSEST BRAN HANG AFTER 2M
```

B.5.7 Orientations

The basic ways of defining an orientation are:

- Orientation attribute plus optional WRT. For example:

```
ORI OF /BOX1 WRT /*
```

- Cartesian orientation. For example:

```
dir IS dir AND dir IS dir
```

- For example to set an orientation of an element to that of a section, rotated by 90 degrees use:

```
(E IS U WRT /SCTN1 AND N IS E WRT /SCTN1)
```

- The AXES keyword, which will allow you to use P-points to specify orientations.
- The syntax is:

```
             ----<---------.
            /              |
>-- AXES --*--- PArrive ---|
            |               |
            |--- PLeave ----|
            |               |
            |--- PTail -----|
            |               |
            |--- HHead -----|
            |               |
            |--- HTail -----|
            |               |
            '--- PPOINT n --+-- OF - <gid> ---->
```

- An example is:

```
( AXES PLEAVE IS AXES PLEAVE OF PREV AND AXES P3 IS UP )
```

- This will orient a branch component, such as a valve, so that it is aligned with the previous component and its P3 is up.
  See also *Comparing Positions*.

B.6 Text Expressions

Text expressions can contain the following:

- A text string, which must be enclosed in quotes. For example: ’FRED’.
- A PDMS attribute of type text or word. For example: FUNC
- A single element of a word array attribute. For example: ELEL[2].
- Text operators
- Text functions

B.6.1 Text Operator

The text operator available is +, used for concatenation.

Synopsis	`text1 + text2 -> text          -> text`
Description	Return the concatenation of two text strings.
Side Effects	None.
Example	`'no' + 'space' -> 'nospace'`
Errors	Text result too long.

B.6.2 Text Functions

The text functions available are:

Function	Comments
AFTER	
BEFORE	
DISTANCE	
LOWCASE, UPCASE	
PART	
REPLACE	
STRING	
SUBS, DSUBS	
TRIM	
VTEXT	

AFTER

Synopsis	`AFTER ( text1 , text2 )      -> text`
Description	Return the substring of **text1** which is after the leftmost occurrence of **text2** in **text1**. If **text2** does not occur in **text1**, the null string is returned.
Side Effects	None.

Example	`AFTER ( 'abcdef' , 'cd' )  ->'ef'`
	`AFTER ( 'abcdef' , 'x' )  -> ''`
	`AFTER ( 'abcdef' , '' )   -> 'abcdef'`

Errors	None.

BEFORE

Synopsis	`BEFORE ( text1 , text2 )    -> text`
Description	Return the substring of **text1** which is before the leftmost occurrence of **text2** in **text1**. If **text2** does not occur in **text1**, text1 is returned.
Side Effects	None.

Example	`BEFORE ( 'abcdef' , 'cd' ) -> 'ab'`
	`BEFORE ( 'abcdef' , 'x' )  -> ''`
	`BEFORE ( 'abcdef' , '' )  -> ''`

Errors	None.

DISTANCE

Synopsis

```
DISTance ( number1 )            -> text
DISTance( number1, logical1,    -> text
logical2, logical3, number2,
logical4)
```

Description

For the one-argument form, if the current distance units are FINCH, text is the conversion of the decimal inches value **number1** into the format 'aa'bb.cc/dd'. Otherwise, text is the STRING conversion of **number1**.

The six-argument form is more complex. The format is:

```
DIST/ANCE (distance, feet, usformat,
fraction, denom_or_dp, zeros)
```

where:

- **distance** is the numeric distance in inches that is to be formatted.
- **feet** is a logical flag set to true if output is to be in feet and inches and to false if output is to be in inches.
- **usformat** is a logical set to true if US format is to be used or false if PDMS format is to be used.
- **fraction** is a logical set to true if the fractional component is to be output as a fraction or false if to be output as a decimal denom_or_dp is a number representing the largest denominator if **fraction** is TRUE or representing the number of decimal places if it is FALSE.
- **zeros** is a logical set to true if zeros are to be shown when that component of the output has no value

PDMS

For both US and PDMS formats the following rules are observed:

- If **distance** is negative, the first symbol is a minus sign.
- If **feet** is true and the distance is at least a foot, then the number of feet is output next, followed by a single quote (’). Only if zeros is true will the number of feet be output as 0 for distances less than a foot. Otherwise the feet will be omitted.
- If feet have been output, the inches will be at least two characters wide. Numbers less than ten will be preceded by a space if US format is being used or a zero if PDMS format is used. A zero will be output if there are no whole inches.
- If no feet have been output and the distance is at least an inch, then the number of inches is displayed but without any preceding spaces. Only if zeros is true will a 0 be output for distances of less than an inch.
- If inches have been output and **fraction** is true, these will be followed by a decimal point (.).
- If **fraction** is TRUE and the number has a fractional component, then the numerator and the denominator are shown separated by a slash (/). This is then blank padded up to the width that the largest numerator and denominator would take.
- If fraction is FALSE and the number of decimal places is greater than zero, then the decimal point (.) is displayed followed by the remainder up to the appropriate number of decimal places. If the number of decimal places is 0 then the decimal point is not shown either.
- If US format has been selected then the following additional rules are observed on output:
- The (’) after the number of feet is followed by a dash (-).
- The decimal point separating the inches from the fraction is replaced by a space.
- The inches and fraction of inches are followed by a double quote(”).

Side Effects None.

Example

If the current distance units are FINCH:

```
DISTANCE ( 17.5 ) ->  ’1’5.1/2’
```

Some examples, where the current distance units are feet and inches:

```
DIST(34.5,TRUE,TRUE,TRUE,100,TRUE) -> 2’-10.1/2.
DIST(34.5,FALSE,TRUE,FALSE,1,TRUE) -> 34.5”
DIST(34.5,FALSE,TRUE,TRUE,4,FALSE) -> 34 1/2”
DIST(128.5,TRUE,FALSE,TRUE,2,TRUE) -> 10’08.1/2”
```

The following table shows sets of options that could have been chosen and the format of the output produced for different numbers. Blanks output by the system are represented by underscores(_).

Distance	**Feet & Inch** **US** **Fraction** **Denom 100** **Zeros**	**Feet & Inch** **US** **Fraction** **Denom 32** **No Zeros**	**Inches** **US** **Decimal** **DP 1** **Zeros**	**Inches** **US** **Fraction** **Denom 4** **No Zeros**	**Feet & Inch** **PDMS** **Fraction** **Denom 2** **Zeros**
128.5	10’-_8_1/2”___	10’-_8_1/2”__	128.5”	128_1/2”	10’08.1/2
120.0	10’-_0”_______	10’-_0”______	120.0”	120”____	10’00____
11.5	0’-11_1/2”___	11_1/2”__	11.5”	11_1/2”	0’11.1/2
0.75	0’-_0_3/4”___	3/4”__	0.8”	3/4”	0’01____
0.0	0’-_0”_______	_______	0.0”	____	0’00____
-10.0	-0’-10”_______	-10”______	-10.0”	-10”____	-0’10____

Errors

The value is too big to be converted.

LOWCASE and UPCASE

Synopsis

```
UPCase ( text1 )            -> text
LOWCase ( text1 )           -> text
```

Description

Return an upper or lower case version of **text1**.

Side Effects

None.

Example

```
UPCASE ( ’False’) -> ’FALSE’
LOWCASE ( ’False’) -> ’false’
```

Errors

None.

PART

Synopsis	`PART(text1, number1)` -> text `PART(text1, number1 , text2)` -> text
Description	With two arguments, returns the `number1` component of `text1` assuming that `text1` is split on any whitespace characters. If `number1` is negative, counting of components starts from the right. With three arguments, as above, but use `text2` as the separator on which splitting takes place. If the user gives a part number higher than the number of components in the string, the function returns an empty string.
Side Effects	None.

Example	`PART ('x-y-z', 1, '-' -> 'x'`
	`PART ('a  b  c  d  e', 4-> 'd'`
	`PART ('/PIPE45/B9', -1, '/')  -> 'B9'`
	`PART('aa bb cc', 2) ->  'bb'`
	`PART('aa-bb-cc',3,'-')  -> 'cc'`

Errors	None.

REPLACE

Synopsis	`REPLace (text1,text2,text3)` -> text `REPLace(text1,text2,text3,int1)` -> text `REPLace(text1,text2,text2,int1,int2)` -> text
Description	Replace search string **text2** in input string **text1** with replacement string **text3**. If **int1** is given this specifies the first occurrence of **text2** at which to start replacement. If **int2** is given this specifies the number of replacements to make. int1 and/or **int2** may be negative to indicate that the direction is backwards.
Side Effects	None.

Example

Three arguments:

```
REPLACE ('cat dog cat cat dog ', 'cat',
'dog' ) -> 'dog dog dog dog dog'
```

All occurrences of 'cat' are replaced with 'dog'.

Four arguments: start occurrence given:

```
REPLACE ('cat dog cat cat cat dog', 'cat',
'dog', 2) -> 'cat dog dog dog dog dog
```

All occurrence of 'cat' from the second occurrence onwards are replaced with 'dog'

```
REPLACE('cat dog cat cat dog' ,'cat',
dog', -2 -> 'dog dog dog cat dog'
```

All occurrences starting at the second occurrence from the end of the string and moving backwards are replaced Note that a negative fourth argument without a fifth argument implies backwards mode.

Five arguments: start occurrence and number of replacements given. Replace two occurrences of 'cat' starting at second occurrence:

```
REPLACE ('cat dog cat cat cat,
'cat','dog', 2,2) -> 'cat dog dog dog cat'
```

Replace two occurrences in backwards direction starting at the second occurrence:

```
REPLACE ('cat dog cat cat cat', ,'cat',
'dog', 2, -2) -> 'dog dog dog cat cat '
```

Replace two occurrences in forwards direction starting at second occurrence from the end of the string:

```
REPLACE ('cat cat cat cat dog', 'cat',
'dog',-2,2) -> 'cat cat dog dog dog'
```

Replace two occurrences in backwards direction starting at second occurrence from the end of the string.

```
REPLACE ('cat cat cat cat dog','cat',
'dog', -2, -2) -> 'cat dog dog cat dog'
```

The following examples all give the same result:

```
REPLACE('cat1 cat2 cat3 cat4 cat5 cat6 cat7 cat8
cat9 cat10', 'cat', 'dog', 4, 2)
REPLACE('cat1 cat2 cat3 cat4 cat5 cat6 cat7 cat8
cat9 cat10', 'cat', 'dog', 5, -2)
REPLACE('cat1 cat2 cat3 cat4 cat5 cat6 cat7 cat8
cat9 cat10', 'cat', 'dog',-6, -2)
REPLACE('cat1 cat2 cat3 cat4 cat5 cat6 cat7 cat8
cat9 cat10', 'cat', 'dog', -7, 2)
```

in each case, the output string is

```
'cat1 cat2 cat3 dog4 dog5 cat6 cat7 cat8
cat9 cat10'
```

If the replacement string **text3** is a null string the required number of occurrences of the search string **text2** are removed. For example:

```
REPLACE ('AAABBABZ', 'B', '') ->
'AAAAZ'
```

```
REPLACE ('AAABBABZ', 'B', '', -1, -1) ->
'AAABBAZ'
```

Errors

If the input string **text1** is a null string or an unset text attribute, the input string **text1** is returned unchanged. For example:

```
REPLACE ('', 'A','B')  ->  ''
```

If the search string **text2** is longer than the input string **text1**, the input string **text1** is returned unchanged. For example:

```
REPLACE('AA', 'AAAAA' , 'B') -> 'AA'
```

If no occurrence of the search string **text2** is found, the input string **text1** is returned unchanged. For example:

```
REPLACE( 'AAAAAA','B','C')            ->
'AAAAAA
```

If required occurrence **int1** is not found the input string **text1** is returned unchanged. For example:

```
REPLACE('AAAAAA', 'A', 'B', 10 )       ->
'AAAAAA'
```

If the number of replacements required **int2** is greater than the actual number of occurrence from the specified start occurrence, replacements are made up to the end of the string (or beginning in backwards mode). For example:

```
REPLACE('AAAAAA', 'A', 'B', 2, 8)   ->
'ABBBBB'
```

```
REPLACE ('AAAAAA', 'A', 'B', -3, 8)  ->
'BBBBAA'
```

STRING

Synopsis

```
STRing ( any scalar type )   -> text
STRing ( number , text1 )    -> text
STRing ( pos , text1 )       -> text
```

Description

Turns a value into a text string.

With a single argument the STRING function can be applied to the following scalar data types:

- Numeric
- Logical
- Id
- Position
- Direction
- Orientation

With only one argument, decimal places are output to give a maximum of six significant figures. Trailing zeros are always removed in this case.

With two arguments the data type may be either numeric (scalar) or position or direction. With two arguments, convert a number or position into a text string using the format described by **text1**, which may take any of the values between ’D0’ and ’D6’ (or ’d0’ and ’d6’), where the number indicates the number of decimal places.

For numbers, STRING always outputs values as millimetres. If unit conversion is needed then the DIST function should be used. For positions, the current distance units are used.

Side Effects

None.

Example

```
STRING ( 1 ) -> ’1’
STRING ( 1 , ’D3’ ) -> ’1.000’
STRING ( 1.23456789 ) -> ’1.23457’
STRING(1.1230000) ->’1.123’
STRING ( 1.23456789 , ’D3’ ) -> ’1.235’
STRING (9*9 LT 100) -> ’TRUE’
STRING (OWN OF CE) -> ’/PIPE1’
STRING(POS) -> ’W1000 N20000 U18000’
STRING(POS, ’D4’ ) -> ’W10000.1234 N20000.1234
U18000.1234’
STRING(HDIR OF /PIPE1-1) -> ’D’
STRING(E 22.0125 N, ’D2’) -> ’E 22.01 N’
STRING (ORI OF NEXT) -> ’Y IS D AND Z IS U’
```

Errors

SUBSTRING and DSUBSTRING

Synopsis

```
SUBString ( text1 , number1 )      -> text
SUBString ( text1 , number1 ,      -> text
number2 )
DSUBString ( text1 , number1 )     -> text
DSUBString ( text1 , number1 ,     -> text
number2 )
```

Description

With two arguments, return the substring of **text1** beginning at the position **number1** to the end of **text1**.

With three arguments, return the substring of **text1** beginning at the position **number1** and of length **number2**. If **number1** is negative, then counting of characters starts from the RHS of the input string. If **number2** is negative, then characters up to and including the start position are returned.

DSUBSTRING used with characters which have a displayed width that is different from standard characters, such as Japanese.

If the chosen range is outside the original string, an empty string is returned

Side Effects

None.

Example

```
SUBSTRING ( 'abcdef' , 3 ) -> 'cdef'
SUBSTRING ( 'abcdef' ,-3 ) -> 'abcd'
SUBSTRING ( 'abcdef' , 3 , 2 ) -> 'cd'
SUBSTRING ( 'abcdef' , -3, 2 ) -> 'de'
SUBSTRING ( 'abcdef' , 3 , -2 ) -> 'bc'
SUBSTRING ( 'abcdef' , 10 ) -> ''
SUBSTRING ( 'abcdef' , -10 , 2 ) -> 'ab'
```

Errors

None.

TRIM

Synopsis

```
TRIM ( text1 )                 -> text
TRIM ( text1, text2 )          -> text
TRIM ( text1, text2, text3 )   -> text
```

Description	When only one argument is supplied, TRIM removes all spaces to the left (leading) and right (trailing) of **text1** and returns the answer in text. When two arguments are supplied, **text2** specifies where the spaces should be removed from: either 'L' or 'l' for left, 'R' or 'r' for right, and 'M' or 'm' for multiple (where multiple occurrences of blanks are squeezed to a single spaces) or any combination of the three key letters. So the default is 'LR' when this field is omitted. When the third argument **text3** is also supplied, this should only be a single character which overrides the space character as the character being trimmed.
Side Effects	None.

Example	`TRIM ( ' How now, brown cow ', 'LRM' ) -> 'How now, brown cow'`
	`TRIM ( '10.3000', 'R', '0' ) -> '10.3'`

Errors	None.

VTEXT

VTEXT is used for the late evaluation of variables.

Synopsis	`VTEXT ( variable-name )      -> text`
	`VTEXT ( variable-name , number )      -> text`

Description	With one argument, it gets the value of the scalar variable or the value of the array variable element. With two arguments, it gets the value of the element corresponding to the index number. The value is returned as a text string. See also VLOGICAL used for late evaluation when a logical result is required, and VVALUE used for late evaluation when a numeric result is required.
Side Effects	If the scalar variable, the array variable or the array variable element does not exist, the result is undefined.

Example	`VTEXT ( !var ) -> 'hello'`
	`VTEXT ( !array[1] ) -> '1.00'`
	`VTEXT ( !array , 2 ) -> '0.00'`

Errors	Errors Scalar variable may not be indexed (e.g. **VTEXT (!var[1])**). Array variable must have an index (e.g. **VTEXT (!array)**).

B.7 Late Evaluation of Variables in Expressions

The functions VVALUE, VLOGICAL and VTEXT are used for late evaluation of PML variables, that is, they enable you to specify PML variables in expressions which will not be evaluated until the expression is evaluated. For example, when you are creating a report template, you are actually creating a macro which will run when a report is generated. All variables in a report template must therefore be preceded by a suitable late evaluation operator; otherwise the system will try to substitute a value for the variable when it is entered on the form. The difference between the operators is the type of output. VVALUE is used to output a numeric value, VLOGICAL to output a logical variable and VTEXT to output a text variable.

B.8 Attributes in Expressions

All attributes and pseudo-attributes may be recognised within expressions. Optionally they may be followed by 'OF' to denote a different element to the current one; e.g. POS OF /VESS1. Brackets may be used to denote an element of an array, for example `DESP[8 + 1]` for the ninth value of DESP. Since syntax clashes are possible, the keyword ATTRIB may be used to denote that an attribute follows. For example, ATTRIB E will denote the pseudo-attribute EAST as opposed to the start of a position or direction. Attributes are described in the Data Model Reference Manual.

B.9 Querying Expressions

All expressions may be queried. Arrays are always concatenated into a single variable. Imperial values are always output as inch to variables. This preserves maximum accuracy. To output in FINCH, then the DISTANCE function must be used. In general expression do not have to be enclosed in brackets, but to be sure that other queries are not picked up by mistake then it is advisable to do so.

Particular queries that could lead to confusion are those available both outside and inside expressions. These are:

- `Q PPOINT n`
- `Q POS or cartesian position`
- `Q ORI or cartesian orientation`

The functionality may vary between outside and inside expression queries. For example, 'Q N 100 FROM /POSS' is not valid. It must be entered as Q N 100 FROM /POSS).

B.10 Units in Expressions

When a user enters a literal value then the units are not necessarily known. The units for PML variables are also unknown. Where units are known, then all internal values are set to mm. The value is then converted to the target (local) units on assignment to a variable or on output.

To cope with 'unknown' units each value remembers its original units internally. An attempt is then made to allow for 'unknown' units across operators.

The internal settings for units are as follows:

Setting	**Comments**
NONE	No units. e.g. attribute OBS.
UNKN	Unknown units. e.g. 10.
MM	Dist/bore attribute if units are MM, or literal e.g. 10 mm.
INCH	Dist/bore attribute if units are INCH/FINCH, or literal e.g. 10’.
SQIN	Multiply two INCH values together, or literal e.g. 10 sq in.
CUIN	Multiply SQIN by INCH, or literal e.g. 10 cu in.

On comparison, addition or subtraction of two values the following assumptions are made. If one of the units is unknown and the other is anything other than UNKN, then the unknown value is assumed to have the same units as the known units. A suitable conversion is then done if the known units is INCH or SQIN or CUIN.

For example:

```
(XLEN GT 10).
```

If we are working in distance units of inches, it is known that XLEN is a distance value. Internally the value is held in mm, but the units are held as INCH. The units for ’10’ are held as unknown. On doing the comparison, the ’10’ is assumed to be inches and thus multiplied by 25.4 to ensure that the comparison works as expected.

Special action is also taken to preserve the correct units across multiplication, division, POWER and SQRT, in particular the maintenance of SQIN and CUIN. In these situations, units of %UNKN are treated as none. For example, `(10 * XLEN)` is assumed to result in INCH rather than SQIN. An exception is made when a reciprocal would result from division. For example: for `(10 / XLEN)` we assume that the 10 is in inches rather than none.

B.11 Precision of Comparisons

To allow for small losses of accuracy, the following tolerances are used.

Object	**Tolerance**
Number	Tolerance factor of 0.000001. In other words, if the difference between two reals is not greater than 0.000001* (maximum of the two values) then the values are considered to be equal. e.g. • (1.000001 GT 1) is FALSE as it considers 1.000001; and 1 to be equal; • (1.000002 GT 1) is TRUE.
Position	Considered to be equal if within 0.5 mm of one another.
Direction or Orientation	Considered to be equal if values are within 0.005.

B.12 Undefined Values

In order to permit expressions like `((DIAM GT 200.0) OR (TYPE EQ 'BOX'))`, expressions must be able to cope with undefined values. Generally, applying an operator to one or more undefined arguments has an undefined result.

Two exceptions are: the use of the AND operator with a false argument, will result in FALSE, regardless of whether or not the remainder of the arguments are defined; and OR which returns TRUE if any of its arguments is TRUE. For example, consider applying the above expression when the current element is a box. DIAM is undefined; therefore `(DIAM GT 200.0)` is also undefined. However, `(TYPE EQ 'BOX')` is certainly true and so the final result of the whole expression evaluates to TRUE.

An undefined result occurs when:

- One of the operands or arguments of a function (except some cases of AND and OR) is undefined.
- An attribute is unavailable for the corresponding element (e.g.`'DIAM OF OWNER'` when the current element is a box).
- An element is undefined (e.g. `'OWNER'` when the current element is the WORLD).
- An attribute is unset (e.g. text attribute or UDA of length 0).
- A variable is undefined (e.g. `'VVAL(!ARC6)'` where **!ARC6** has never been initialised).
- Two position constants are compared with GT, GE, LT or LE and they have no common coordinates (e.g. `'N10 EQ E5'`).
- If the result of the whole expression is undefined, an error occurs.

B.13 Unset Values

A particular class of undefined values are unset values. The concept exists for attributes which are valid for a given element, but for which no value has been assigned. Typically these may be elements of an array, or 'word' attributes. References of value =0/0 are also treated as unset.

Unset values are propagated as for undefined values (except for Boolean operations- see below). Undefined values take precedence over unset. There is a specific logical function UNSET to test if a values is unset.

Across comparisons, unset values are not propagated, but are treated as follows:

Operator	**When Applied to an UNSET**
EQ, GT, GE, LT, LE	Results in FALSE.
NE	Results in TRUE.
OR , AND	Values are treated as FALSE.

For example, if **DESP(2)** and **LVAL(3)** are unset then:

```
(DESP(2) GT 99) -> False
(DESP(2) NE 33) -> True
(:LVAL(3) AND TRUE) -> False
```

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