QEPlotter Widget

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QEPlotter Widget Specification

Introduction

This document describes in detail the QEPlotter widget which is an EPICS aware widget provided by the EPICS Qt Framework, also known as the QE Framework.

This document has been created as a separate widget specification document. The main reason for this is ease of maintenance and avoiding editing large and unwieldly word documents.

Description

The QEPlotter widget is a widget for presenting waveform variables. On receiving an update of an array PV value (often but not always from a waveform record) it will replace the current plot with a plot of the new array value. This widget is intended for presentation of several array PVs, such as from the sscan record. This widget is a complex widget and used as the basis of one of the QEGui's built-in forms.

Up to 16 "Y" variables, named A, B, C, … P, may be plotted against an optional "X" array variable.

The "X" variable and the "Y" variables are specified by a data object and a size object.

A data object is typically specified by a Process Variable (PV), but can also be an expression similar in form to that used by the calc/calcout records (in fact under the covers, QEPlotter uses the same postfix functions as the calc record).

As expected, PVs are specified as a PV name, e.g. "BR01RF01AMP01:OUT_FWD_PHASE_MONITOR".

Expressions are introduced by an equals character, e.g. " =-LN (B/C)". No sensible PV name begins with "=". See the expressions section below for details on expressions.

A size object may be defined by a PV name, e.g. "SR14ID01:scan1.CPT"; as a constant such as "72"; or left blank. Since all "Y" variables are plotted against the "X" variable, the "Y" size is truncated to match the "X" size if needs be.

The following tables show the size and values used for the 'X' variable for each combination of size object/data object.

Size Object	Data Object		
	Blank	Data PV name	Calculation
Blank	n/a	No. Data PV elements	n/a
Size PV name	Value of PV	Min (Value of Size PV, No. Data PV elements)	Value of PV
Constant	Fixed Value	Min (Value of Size PV, Fixed Value)	Fixed Value

Size Object	Data Object		
	Blank	Data PV name	Calculation
Blank	n/a	X [s] := PV [s]	n/a
Size PV name	X [s] := s	X [s] := PV [s]	X[s] := calc (s)
Constant	X [s] := s	X [s] := PV [s]	X[s] := calc (s)

Note: the widget attempts to make sensible assumption if/when the size or data object is blank. For example is no data PV is specified and a constant size, say 40, is specified then the 'X' values run from 0 to 39.

The following tables show the size and values used for the 'Y' variable for each combination of size object/data object. This is similar to the above, although there are some differences.

Size Object	Data Object		
	Blank	Data PV name	Calculation
Blank	n/a	No. PV elements	Number of X elements
Size PV name	n/a	Min (Value of PV, No. PV elements)	Value of PV
Constant	n/a	Min (Value of PV, Fixed Value)	Fixed Value

Size Object	Data Object		
	Blank	Data PV name	Calculation
Blank	n/a	Y [s] := PV [s]	Y[s] := calc (s, X[s], A[s], B[s],...)
Size PV name	n/a	Y [s] := PV [s]	Y[s] := calc (s, X[s], A[s], B[s],...)
Constant	n/a	Y [s] := PV [s]	Y[s] := calc (s, X[s], A[s], B[s],...)

Expressions

Each point of the expression waveform is calculated from the corresponding point of each of the input waveforms. On the QEWidget, the 16 'Y' variables are labelled A to P, so in this expression, the B arguments represents the value provided by the 2nd Y variable, and C the value provided by the 3rd Y variable. X refers to the 'X' variable and S refers to the array element number starting from 0.

The QEPlotter also calculates dA/dX, dB/dX, dC/dX etc. and these are available within expressions as A', B', C' etc. For completeness X' and S' are also available.

Readers familiar with the calc/calcout records will recall that these only support 12 inputs (A to L). The QEPlotter widget performs a translation of the 36 possible inputs onto 12 inputs. It can do provides that no expression uses more than 12 arguments, i.e. = C' + S + X is a valid QEPlotter expression, whereas =A + B + C + D + E + F + G + H + I + J + K + L + M is invalid as there are more than 12 elements.

Scaling and Presentation Control

Currently the QEPlotter is dynamically scaled. Future enhancements will included fixed scaling, normalised scaling, black background. These will be documents as these features are added.