EDM

Extensible Display Manager for EPICS

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Outline

- Introduction
- Program Execution
- Display File Commands
- Creating and Editing Objects
- Manipulating Objects on the Display
- Display Object Classes

Outline (cont)

- Display Execution
- Color Rules
- Macro Expansion
- Symbols
- Current List of Objects

Introduction

- EDM is an interactive GUI builder and execution engine, EPICS documentation uses the term *Display Manager*
- Maintained by ORNL EPICS community
- Component based, thus extensible by other members of the EPICS collaboration

Program Execution - Environment Variables

- EDMDATAFILES
  - export EDMDATAFILES=projectdir:userdir

    e.g. export EDMDATAFILES=
    /usr/displays:/home/me/mydisplays

Program Execution - Command Line Options

- Define symbols
  -m “symbol1=value1,symbol2=value2,…”
  (referenced as $(symbol1))

- Execute mode
  -x (-noedit)

- edm -x -noedit -m “unit=1” displayFile

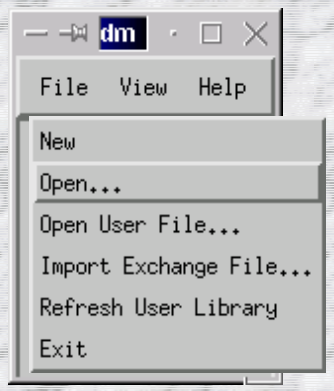
Main Window Display File Operations

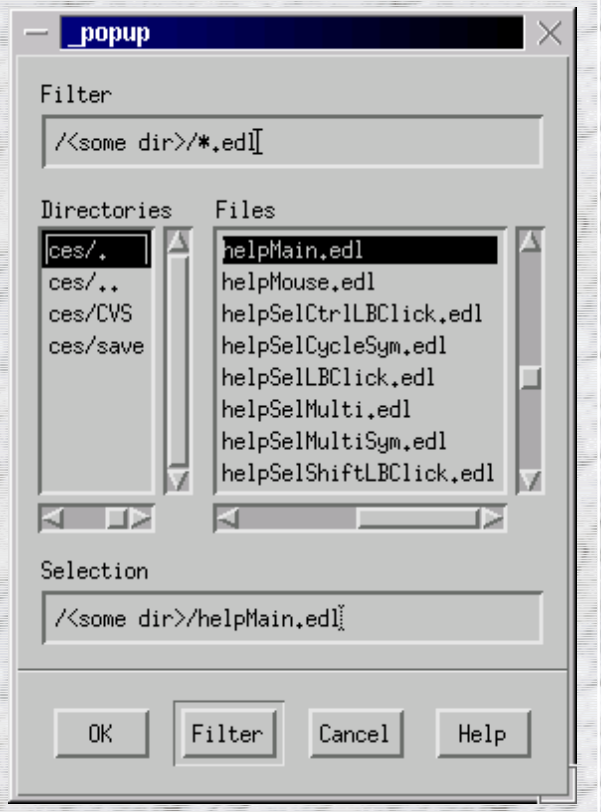
- New
  - user directory
- Open
  - project directory
- Open User File
  - user directory

Main Window File Operations

New

Open

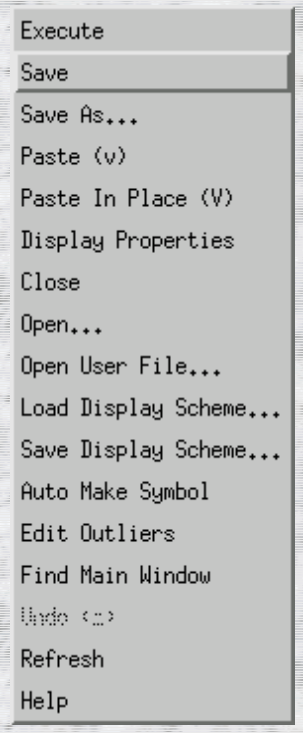




Display Menu File Operations

With no objects selected, click the middle mouse button on the display background

This menu pops-up



Save
Save As…
Close
Open…
Open User File...

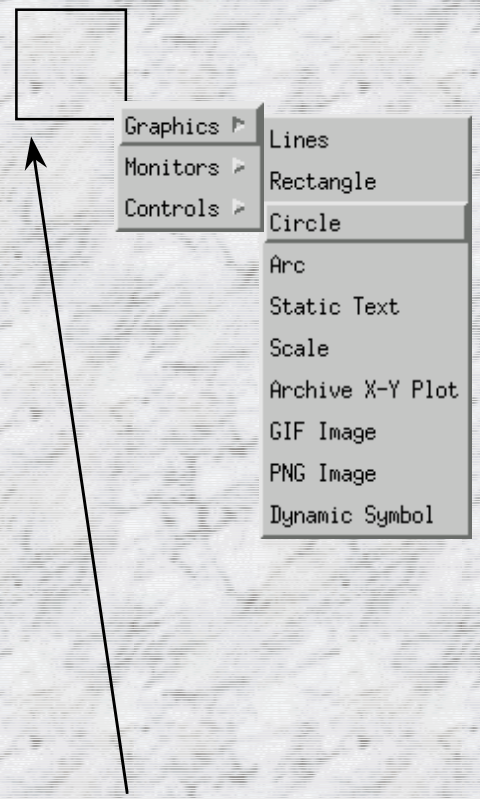
File Operation Notes

- You never need include the file extension in a file open or save operation
- “Save As…” to an existing file requires user confirmation

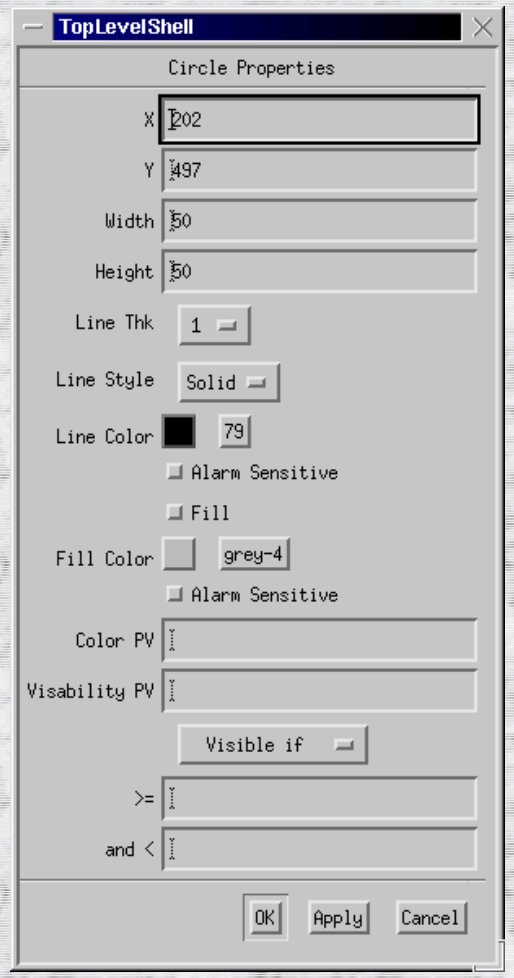
New Project...

- Set EDMDATAFILES
- Create a new display
- Edit display properties and set default fonts and colors
- Save display scheme as default.scheme
- Exit EDM

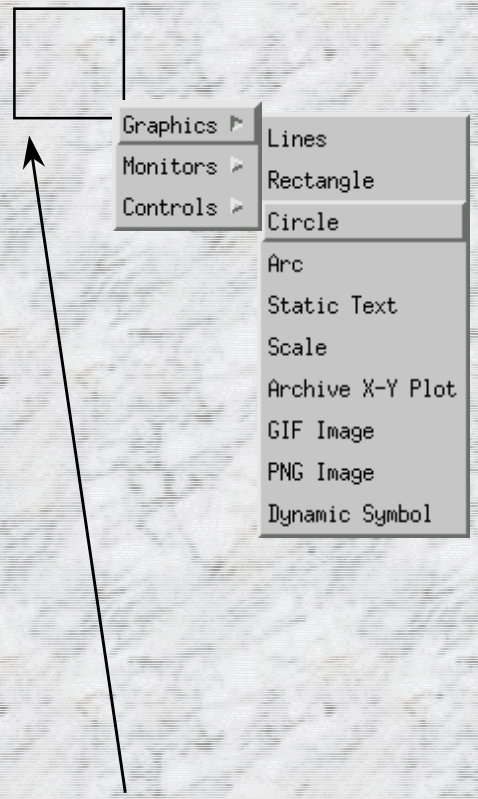
Creating Objects



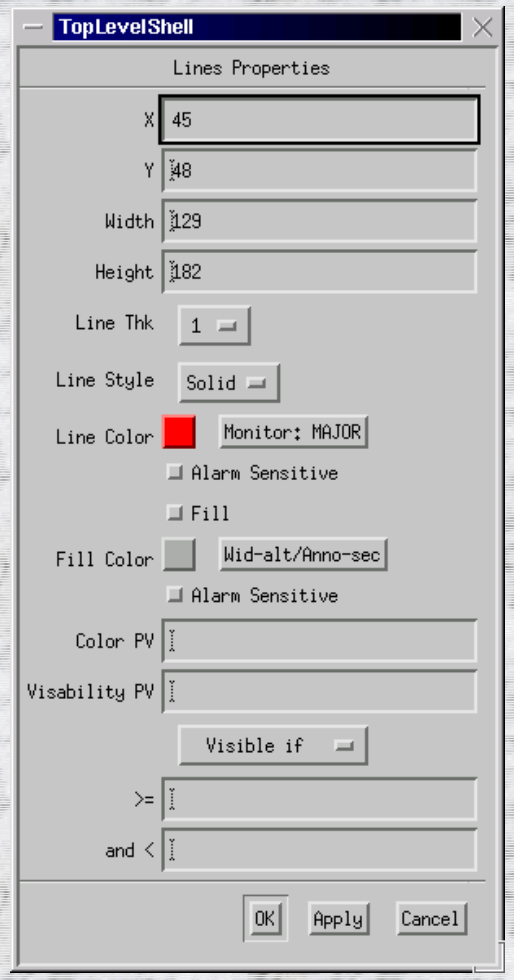
Left mouse button drag

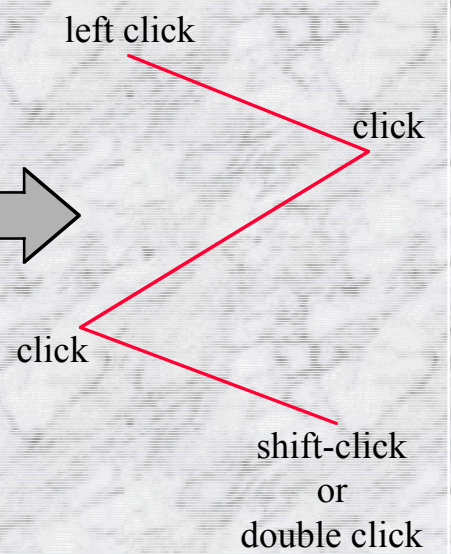


Creating Lines



Left mouse button drag



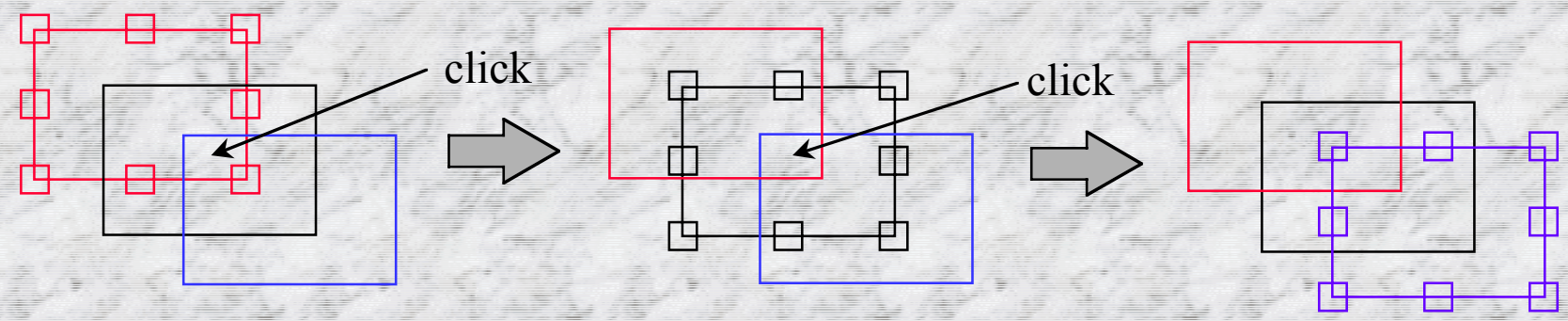


Selecting Objects

- Left button click
  - Single exclusive select: object is selected, currently selected objects are deselected
- Shift-left button click
  - Single inclusive select: object is added or removed from the current group of selected objects

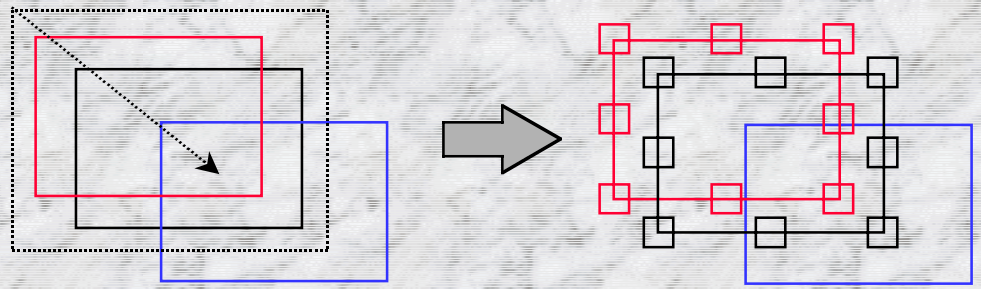
Selecting Objects (cont)

- Control-left button click
  - If only one object is currently selected then selection cycles among overlapping objects

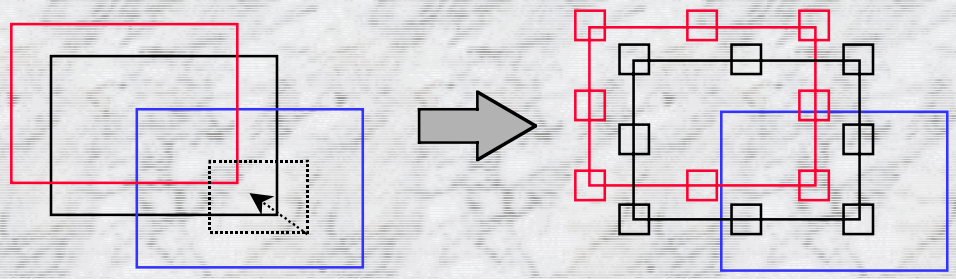


Selecting Objects (cont)

- Middle button drag - objects are added or removed from the current selection group

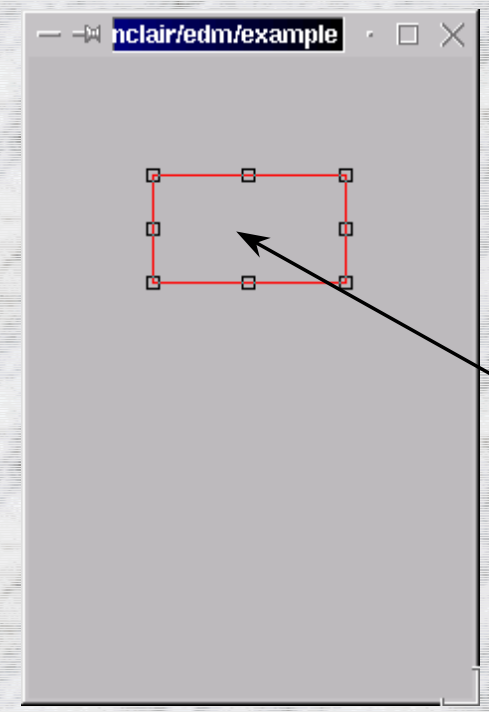


Top-left to bottom-right:
Select enclosed objects

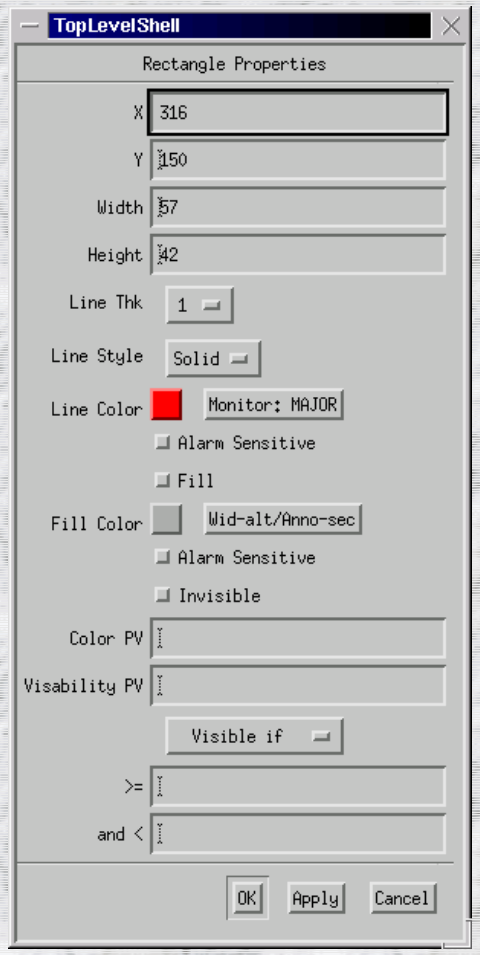


Bottom-right to top-left:
Select enclosed corners

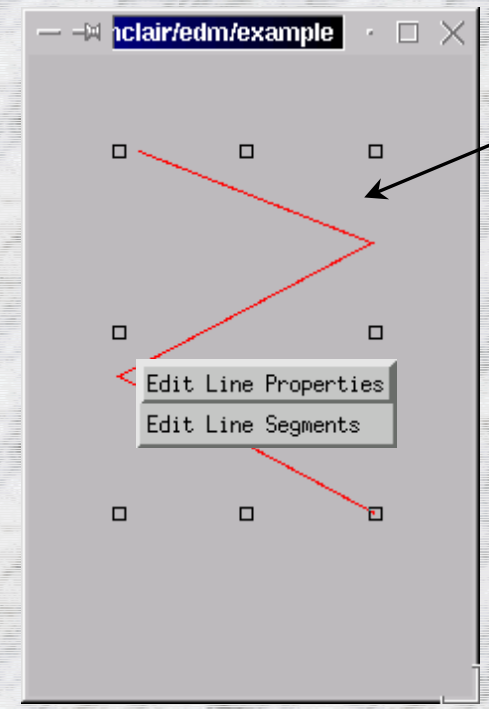
Editing Objects



left click on
selected object



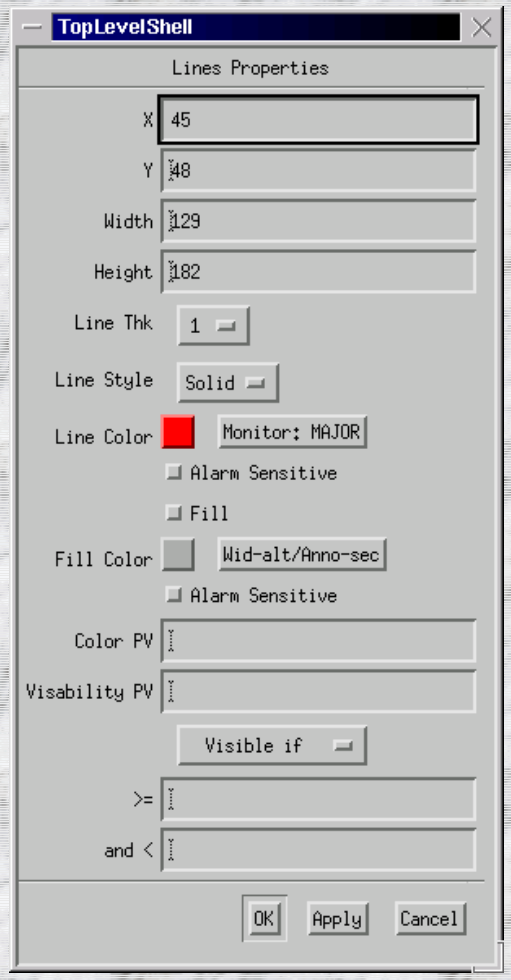
Editing Line Properties



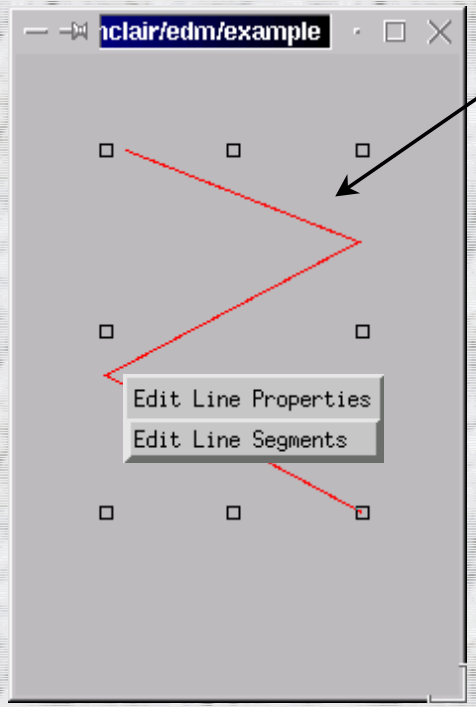
left click on selected object

Menu Appears

Choose Edit Line Properties



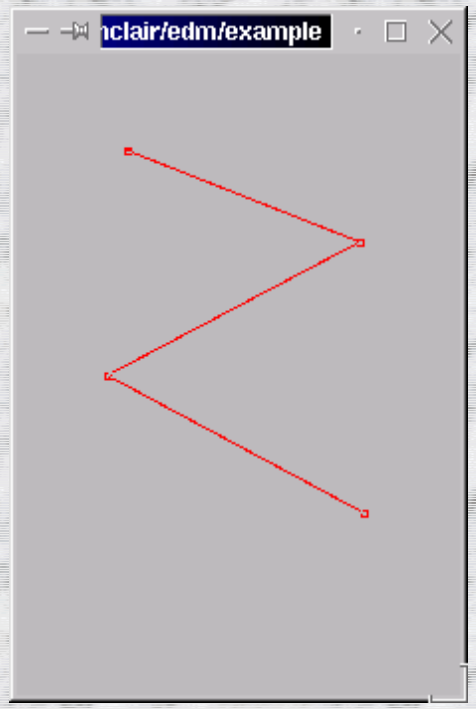
Editing Line Segments



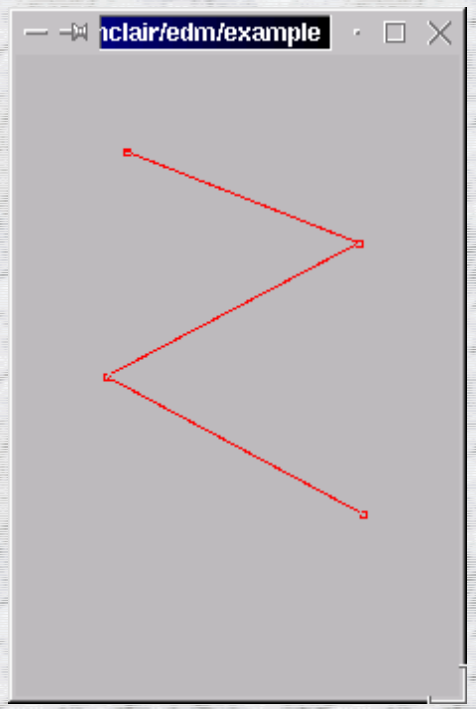
left click on selected object

Menu Appears

Choose Edit Line Segments



Editing Line Segments (cont)

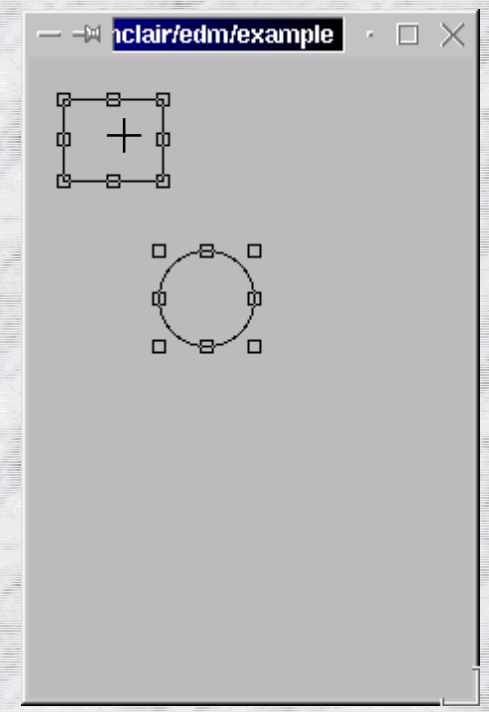


Left-click	Add point
Shift-middle-click	Delete last point
Middle-drag	Move point
Shift-left-click or Left-double-click	Terminate edit operation

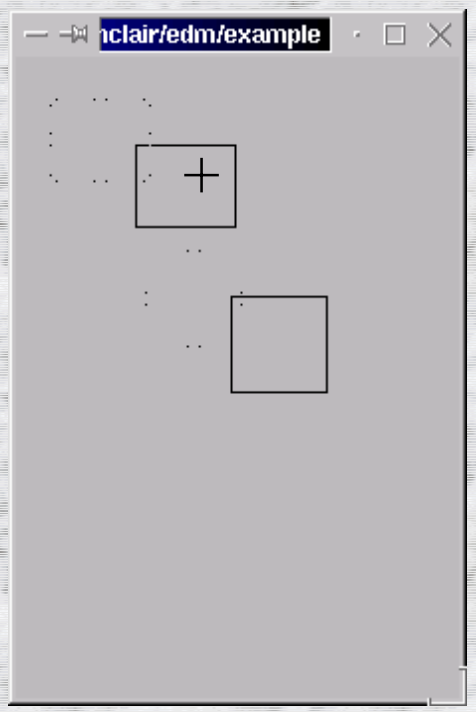
Editing Notes

- Clicking on one of a group of selected objects brings up the property box for each object, one-by-one, as the OK button is pressed.
- To minimize mouse movement, instead of clicking OK, Apply, or Cancel, you may double-click the left, middle, or right button respectively.

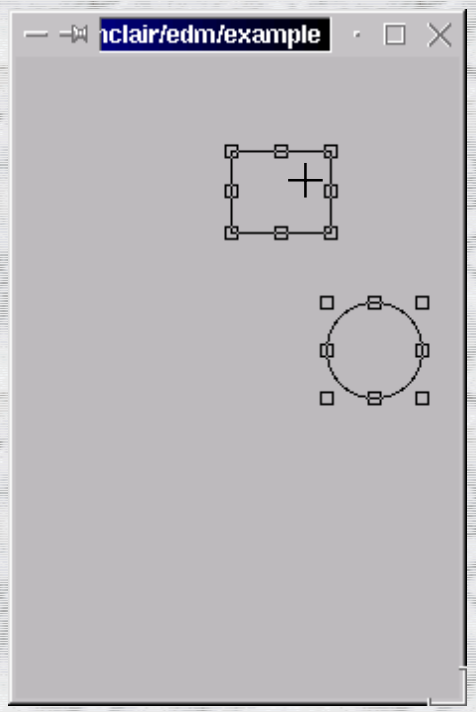
Moving Objects



Place mouse cursor on interior of one object

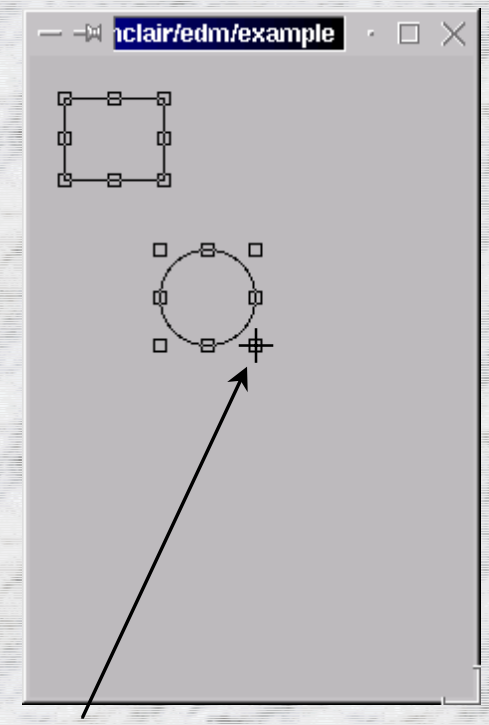


Press left button and drag objects to new location

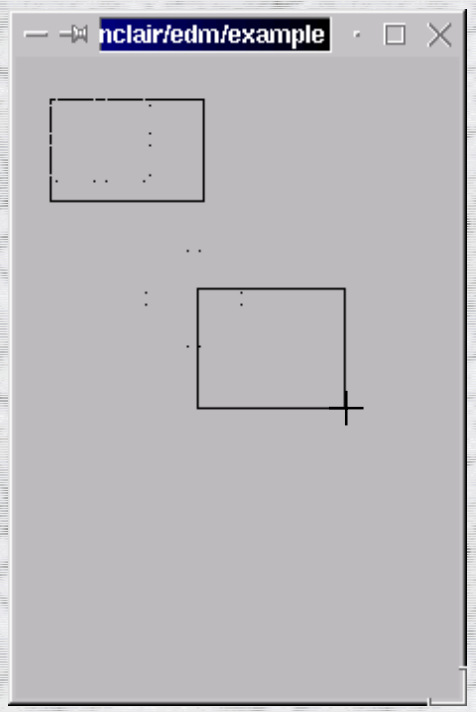


Release mouse button

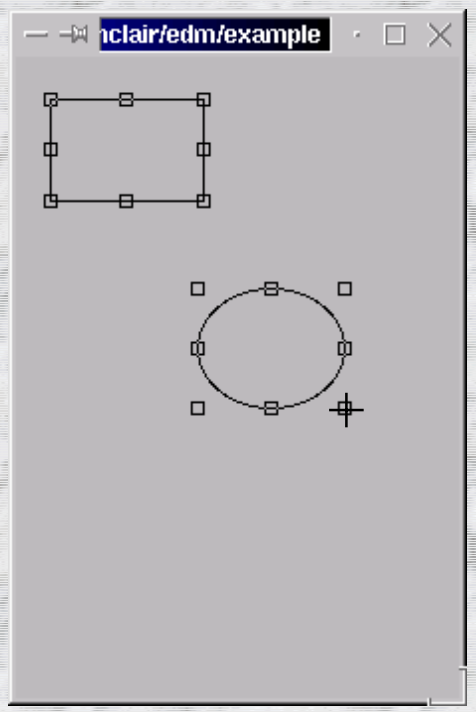
Resizing Objects



Place mouse cursor on control point of one object



Press left button and drag to new size



Release mouse button

Draw/Move/Resize Notes

- Fine control may be achieved on moves and resizes by using keyboard arrow keys (mouse button release or click ends op)
- Control key forces move (prevents risize)
- M/m key turns ON/off orthogonal move
- L/l key turns ON/off orthogonal line draw
- G/g key turns ON/off grid
- S/s key turns ON/off snap-to-grid

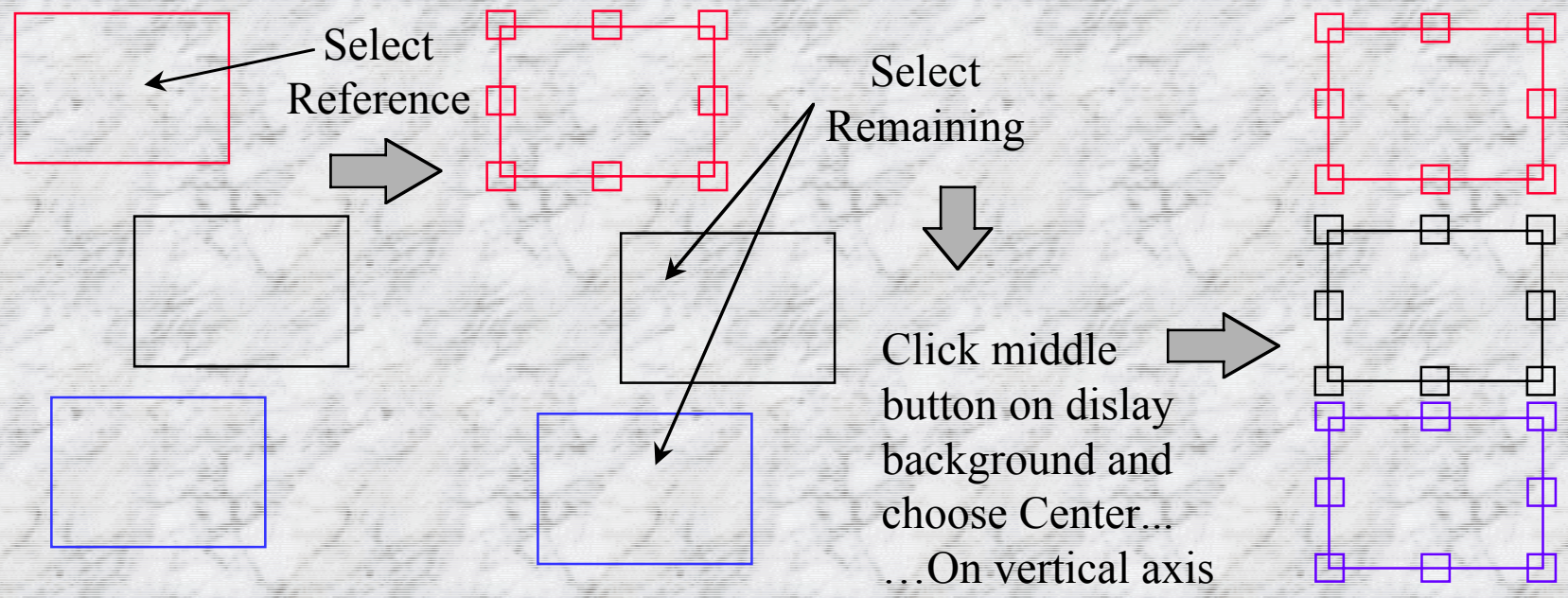
Alignment Operations

- Reference Independent
  - Align left, right, top, bottom
  - Distribute: vert axis, horiz axis
  - Distribute Midpoint: vert axis, horiz axis
- Reference Dependent
  - Center: horizontal, vertical, both
  - Size: width, height, both

Reference Dependent Operations

- First object selected is used as reference
- If no reference object is specified, an appropriate object is chosen (topmost, leftmost, etc.)

Example Align Operation



Misc Operations

- Raise, Lower
- Copy, Cut, Paste
- Group, Ungroup
- Flip H & V
- Rotate CW & CCW
- Group Edit
- Undo

Group Edit

- Change visual attributes of all selected objects
- Change PV names for all selected objects

Undo - Current Limitations

- Most useful for move, resize, & alignment operations
- Cannot undo edit operations
- Cut, Group, and Ungroup : Flush undo stack

Exercise 1- Display Schemes

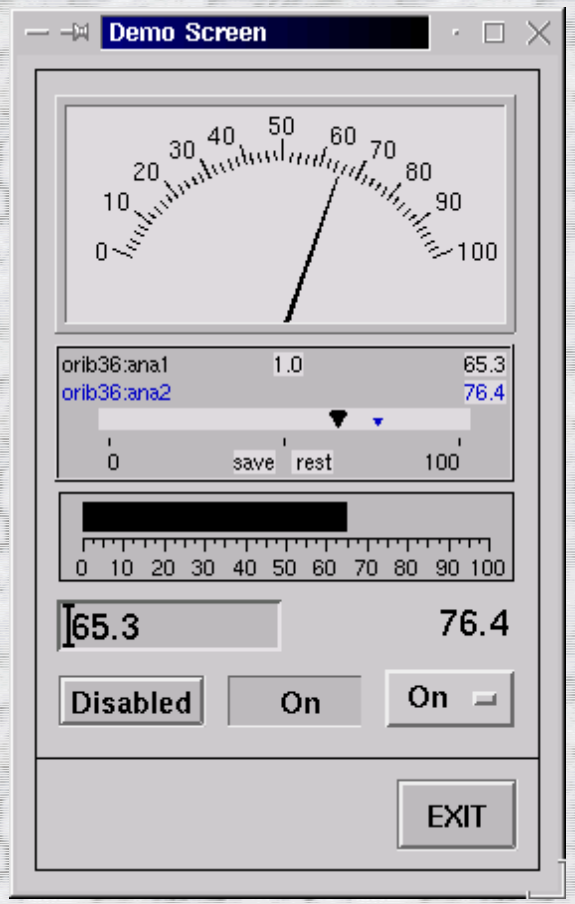
- Execute edm
- Create a new display
- Invoke the middle mouse button menu to edit display attributes
- Select default fonts and colors, Click OK
- Invoke the menu again, select *Save Display Scheme*, make the file name *default.scheme*
- From the main window, choose file-->exit

Exercise 2

- Execute edm
- Create several graphic objects
- Explore the basic object manipulation operations
  - Select, copy, paste, move, resize, align, …
- Explore the edit operation
  - Change colors, line thickness, …
- Explore snap-to-grid, ortho move & line draw
- Save the display as example1

EDM Objects

- Graphics
  - Lines, rectangle, circle, arc, text, gif, png, dynamic symbol
- Monitors
  - Meter, bar, message box, symbol, text update, strip chart
- Controls
  - Text, slider, button, menu button, message button, up-down button, multiplexor, related display, shell command


Demo Screen
0 10 20 30 40 50 60 70 80 90 100
orib36:ana1 1.0 65.3
orib36:ana2 76.4
0 save rest 100
0 10 20 30 40 50 60 70 80 90 100
65.3
76.4
Disabled
On
On
EXIT

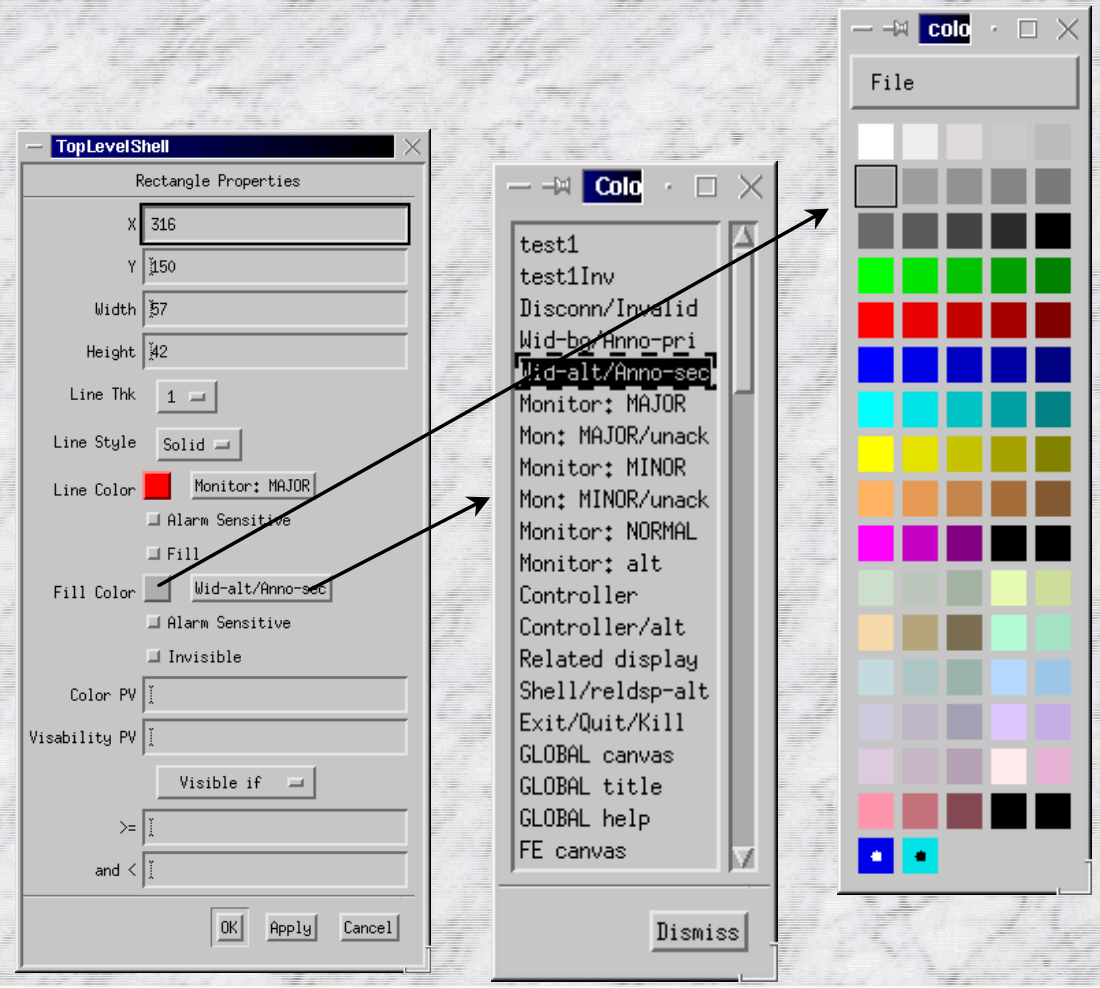
Display Execution

- Macro symbols are expanded
- Colors rules become active
- Visibility rules become active
- The rendering of control and monitor objects may change substantially; in execute mode certain components of these objects usually change in response to PV value changes and/or operator interaction

Execute-mode Behavior

- Color Rules
- Macro Expansion
- Illustration through several objects
  - Related Display
  - Shell Command
  - Exit Button
  - Static Text
  - Control Text

Specifying Color



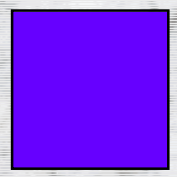
Color may be specified visually or by name

Color - Static and Dynamic

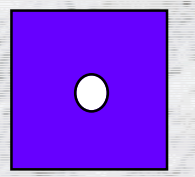
- Some color entries are dynamic and are associated with a color rule
- In execute mode, dynamic colors change as a function of the color rule operating on the current value of an associated EPICS PV
- An invisible color may be defined

Color - Static and Dynamic

- Colors may be specified for various object attributes and appear as one or more buttons in object property dialog boxes. Dynamic colors are differentiated from static colors in the following manner:



Static



Dynamic

Color Rules

- Color Rules are give in the edm color list file. The following is an example of a rule named *Red-or-Blue*:

```
Red-or-Blue rule {
  <5        : Red
  >=5       : Blue
}
```

Using this rule, a rectangle object could be made to change color at run-time depending on the value of some EPICS pv

EDM Macro Expansion

- Macro symbol sources
  - Command line
  - Related Display parameter
  - Multiplexor
- At run-time, symbol expands to associated value

e.g. -m “one=1” at run-time, $(one) → 1

Exercise 3 (1 of 3)

- Objective:
  - Examine operation of dynamic colors
  - Explore macro symbol expansion
- Execute edm and open example1
- Add a related display button
  - 1st Entry, Filename: relatedDsp1, Symbols:param=1
  - 2nd Entry, Filename: relatedDsp1, Symbols:param=2
- Add a text control
  - Editable=Yes, obtain the Control PV name from an instructor, this same PV name will be used in a color rule
- Save the display file

Exercise 3 (2 of 3)

- Create a new display
  - Create a static text object with *Text Value* set to param=$(param)
  - Create a rectangle, choose a dynamic color for *line color*, obtain the color rule name from an instructor and use the PV name from above
  - Create an exit button
- Save the new display as *relatedDsp1* and close the display window
- Return to the example1 display, deselect all objects, click the middle mouse button, and choose *execute* from the menu

Exercise 3 (3 of 3)

- Click the Related Display button and choose a menu item, the associated display should appear and the static text object should display the symbol value
- Change the value of the PV from the example1 text control, the rectangle color should be determined by the color rule
- Experiment with various options
- When you have finished experimenting, click the Exit Button on each related display
- Exit edm

Symbols

- EDM implements a primitive symbol facility
- Symbols are multi-state objects where each state maps to a value range of an associated EPICS PV
- 64 states max, color and size may be changed per symbol instance if so desired

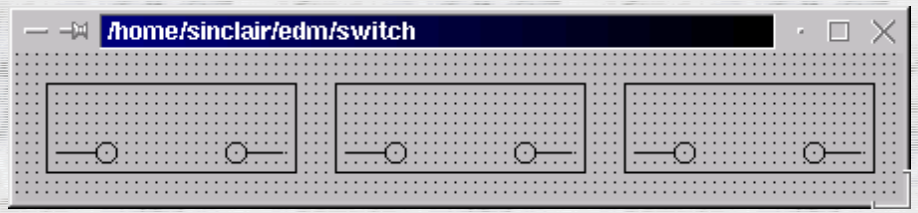
Symbols (cont)

- An EDM symbol is nothing more than a standard display file where each symbol state is represented as a group of objects
- Only one grouping level is allowed
- The visual ordering corresponds to the ordering of states
- EDM contains an auto-make symbol command to perform the grouping and ordering

Creating Symbols

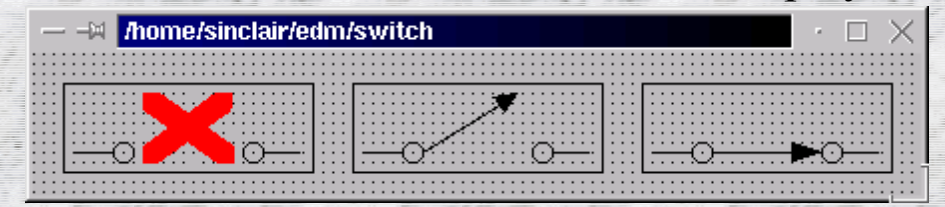
1. Create a rectangle corresponding to the geometric boundaries of the symbol, check the invisible attribute of this rectangle
2. Draw the invariant visual components of the symbol

3. Copy this information and paste it N times, you now have N+1 visual states



Creating Symbols (cont)

4. Draw the state dependent visual components, the first state should be the out-of-band state, the second state is displayed in edit mode



5. Make sure no grouped objects exist, click the middle mouse button on the display background, and choose *Auto make symbol* from the menu
6. Save the EDM display file, this file may now be used as a symbol file

Deploying Symbols

- A symbol instance is created like any other EDM object
- One property of a symbol instance is the symbol file name; this is the file discussed previously
- An exercise will illustrate this entire process in detail

Exercise 4 (1 of 3)

- Objective:
  - Create symbol template file
  - Explore symbol dynamic behavior
- Execute edm and create a new display
- Draw 3 symbol states as follows
  - Create invisible rectangle
  - Draw invariant symbol components
  - Copy image and paste two copies to the display
  - Draw state dependent components

Exercise 4 (2 of 3)

- Arrange images in a rows/columns ordering, first state is upper-left, last is lower-right
- If any objects have been grouped, ungroup now
- Click middle button, choose *Auto make symbol*
- Save symbol file as symbol1

- Open example1
- Add a symbol instance
  - Use symbol file recently created, use same PV as referenced in text control object
  - State 1: 1 <= PV value < 0
  - State 2: 2 <= PV value < 1

Exercise 4 (3 of 3)

- Save the display file
- Execute the display, change value of the PV, and observe the symbol behavior
- Experiment with symbol color options

Graphics

- Rectangle
- Circle
- Arc
- Lines
- Text
- Image - GIF & PNG
- Dynamic Symbol

Monitors

- Analog Meter
- Bar Meter
- Byte
- Strip Chart
- Text
- Symbols

Controls

- Text
- Slider
- Buttons
  - binary, message, menu, up-down, exit
- Message Box
- Related Display
- Shell Command

Exercise 5

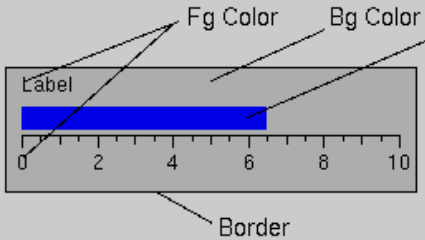
- Obtain several PV names from instructor
- Experiment with various graphic, monitor, and control objects

Questions

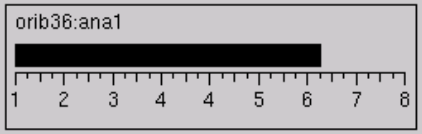
- How do I …

Bar

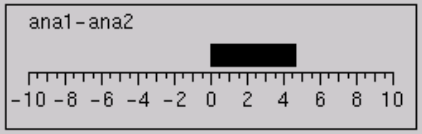
Bar



Border: Yes
Show Scale: Yes
Label Type: Literal
Origin: 0



Border: Yes
Show Scale: Yes
Label Type: PV Name
Origin: 1



Bar shows Readback – Null

Border: Yes
Show Scale: Yes
Label Type: Literal
Origin: 0
Readback & Null PV specified

Border: No
Show Scale: No
Label Type: Literal
No Label string specified
Origin: 0

Scale Format Options

GFloat – precision gives number of significant digits
FFloat – precision gives number of decimal places
Exponential – precision gives number of decimal places,
number is displayed in scientific notation

If Scale Info From DB is checked, then scale precision, min, and max are taken from HOPR & LOPR fields in database.

Static Text

Static Text

Text String

Fg Color
Bg Color
Use Display Bg: Yes

Text String

Fg Color
Bg Color
Use Display Bg: No

Text String — Auto Size: No, left justified

Text String — Auto Size: No, right justified

Text String — Auto Size: No, center justified

Note: The dashed lines around the text strings have been added to show the actual object size boundaries.

Text string may contain symbols.

Auto Size sets the geometrical boundary of the text string and should not be used with center and right justification.

Color PV is used with dynaimic colors and alarm sensitivity.
If both are present, alarm colors have precedence.

Visibility may be achieved through visibility PV and embedded rule or with invisible color.