# 10 Instancing Cells

# Design Hierarchy

Cells can contain two types of components:

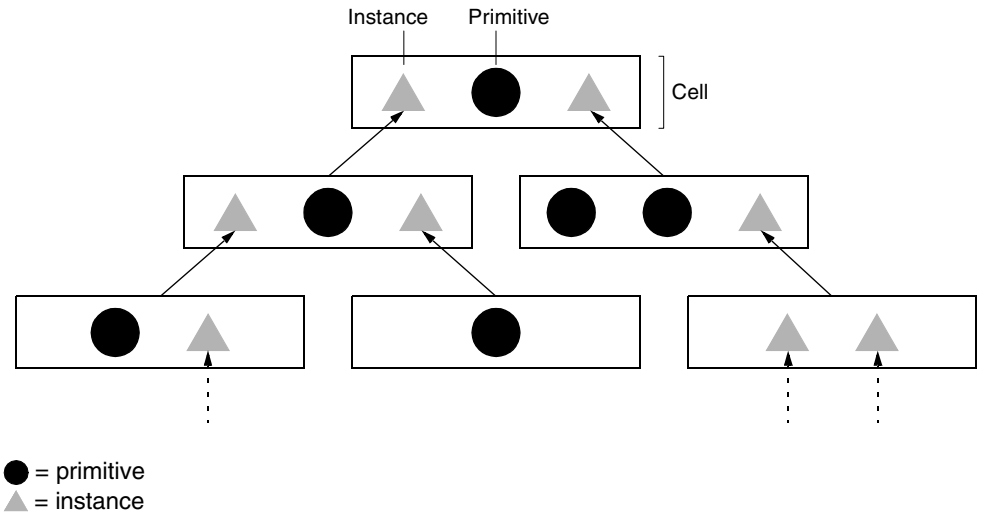
- Primitives—geometrical objects created in the cell
- Instances—references to other cells

An *instance* is a representation of a cell in a particular location and orientation in another cell. An instance can reference a cell composed of primitives, other instances, or a combination of primitives and instances. An *instancing* cell contains such a representation; an *instanced* cell is the source, or referenced, cell.

Changes made to the instanced (source) cell are automatically propagated to all instances of that cell. Layouts that use instances consume less memory than "flat" designs where all the features exist as originally drawn objects.

In an efficient design, cells, primitives, and instances form a treelike hierarchical structure. The most elementary cells reside near the "bottom" of the hierarchy; the subsystem cells, composed largely of instances, reside near the "top." Actions on a particular cell affect all of its instances in cells "above" it in the hierarchy.

The figure below illustrates a design hierarchy:

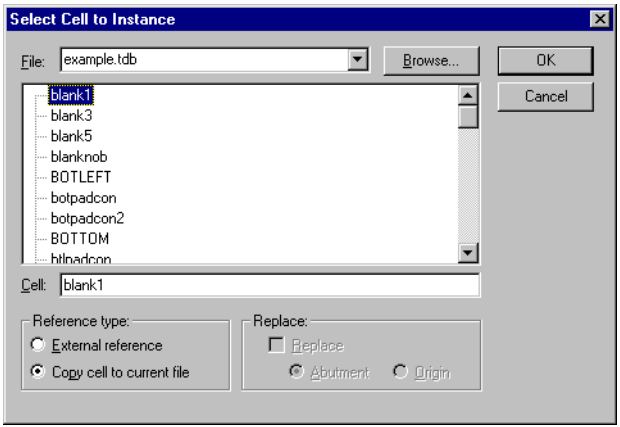

Instance
Primitive
Cell
= primitive
= instance

# Creating Instances

You can instance a cell from the active TDB file or another TDB file (XrefCell). (See XrefCells on page 1-399.)

To create an instance:

- Drag and drop the original cell from the Design Navigator into the current cell. (See Performing Operations on Cells on page 1-393.)
- Use **Cell > Instance**, press **I**, or click on the **Instance** icon  in the Drawing toolbar to open the **Select Cell to Instance** dialog.




Options include:

**File**

Name of the active file (default) or any other file specified from the drop-down list. In the drop-down list, red indicates a TDB file that is open but not active, blue indicates a cross-referenced TDB file. To view a file not currently open, click the **Browse** button.

**Cell**

Name of the cell currently selected in the cell list. To select a cell, highlight its name in the cell list. Double-click or click **OK** to create an instance of the cell.

**Reference type**

Available when you instance a cell from a file other than the active file—that is, an Xref file. You can instance cells from other files in two ways:

- **External reference** creates an XrefCell and then updates the instance whenever the XrefCell is changed (as long as the link to the XrefCell is not broken).
- **Copy cell to current file** copies the cell to the active file and creates an instance of that local cell (see Copying and Duplicating Objects on page 1-362).

If you try to instance a cell from an Xref file but the cell is already in your active file, the instance will be made from the existing Xref cell. (For more information on XrefCells, see XrefCells on page 1-399.)

**Replace**

Replaces the instance in the layout area with an instance of the specified cell When this option is checked, two other options become available:

- **Abutment**—aligns the instance selected in the layout with the replacement instance according to their abut ports. For a detailed description, see Aligning Instances by Abut Ports on page 1-428.
- **Origin**—aligns the instance selected in the layout with the replacement instance according to their origins. With this option, the replaced instance maintains the position of the previous instance with respect to the origin (position 0,0) of the coordinate system.

In the cell list, bold font indicates that a cell has been edited and the changes have not been saved.

You can use the search feature to select cell names by typing instead of scrolling and clicking. As you type letters in the **Cell** field, L-Edit automatically selects the first name in the list beginning with the (case-insensitive) pattern entered.

For example, typing a **g** causes the first cell name beginning with **g** or **G** to be highlighted; adding a **u** highlights the first cell beginning with **gu**, **Gu**, **gU**, or **GU**; and so on.

***Note:*** A cell cannot instance itself—that is, you cannot create an instance of a cell in the cell itself.

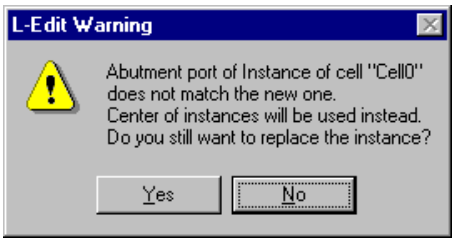
## Aligning Instances by Abut Ports

When you select an instance and replace it, you have the option of aligning the selected instance and the replacement instance according to their origins or abut ports.

An *abut port* is a box port with text that matches the **Abutment** field in the dialog **SPR Core Setup—General**. When you replace an instance and specify alignment by abut port, L-Edit examines the selected instance and the instance you are replacing it with to see if their abut ports match. The check of abut port names is case-sensitive.

If the abut ports in the two cells have matching names and dimensions, L-Edit places the new instance in exactly the same position as the previous one. If the abut ports in the two cells do not match, or if there are no abut ports in either cell,

L-Edit will prompt you with the following dialog for permission to align on the instances on their centers.

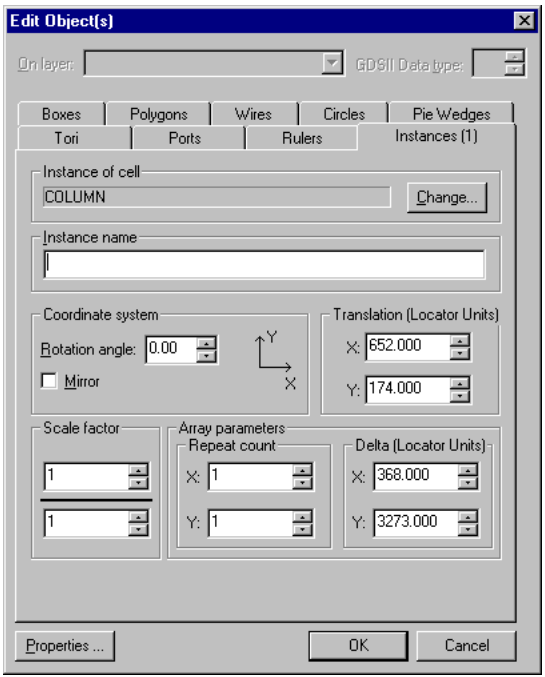



For further information on abut ports, see **SPR Core Setup–General** (page 2-45).

## Creating Arrays

An *array* is a two-dimensional arrangement of instances, offset in the vertical and/or horizontal directions by specified amounts. A single instance is equivalent to a 1x1 array.

To create an array, select the instance and choose **Edit > Edit Object(s)**, press **Ctrl + E**, double-click the MOVE/EDIT mouse button, or click the edit object(s) button ( ).




In the **Array parameters** tab, enter the horizontal and vertical repeat count and the X and Y spacing between array elements. You can also create an array by grouping instances (see Grouping and Ungrouping Objects on page 1-353).

# Editing Instances

An instance cannot be reshaped, sliced, or merged, and vertices and edges cannot be individually edited. However, the instance as a whole can be:

- Moved
- Rotated (see **Reorienting** (page 1-360))
- Flipped (see **Reorienting** (page 1-360))
- Text-edited (for example, to increase the array size) (see Editing Instances on page 1-431)

You can edit the contents of an instance or array in two ways:

- Return to the original cell and make the desired changes there
- Use **Edit > Edit In-Place** (see Editing In-Place, below)

Changes made in an original cell are automatically propagated to all instances and arrays of that cell.

***Note:*** If the instance contains objects drawn on a locked layer, it cannot be edited or moved. To edit or move such an instance, you must first unlock the currently locked layer or layers.

## Editing In-Place

Editing in-place allows you to edit an instance without opening the original cell.

***Note:*** Editing in-place is not available for instances that have been rotated by non-orthogonal angles or instances of XrefCells.

To edit in-place an instance:

☑ Select the instance to edit.

☑ Choose **Edit > Edit In-Place > Push Into**, press **Page Down**, or click the push edit in-place button (  ) to "step down" into the instance.

After you have stepped down into an instance you can edit the contents of the instance as if you had opened the original cell. The original cell will also show the changes made to the instance.

While editing in-place you can only select or edit objects contained in the instance. This includes regular geometry as well as other instances or arrays.

You can step down multiple levels in an instance. Continue selecting instances and use **Edit > Edit In-Place > Push Into** as described above.

☑ To step up in the hierarchy and end the edit in-place session, use **Edit > Edit In-Place > Pop Up**, press **Page Up**, or click the pop edit in-place button (  ) on the Standard toolbar.

When you are editing in-place, you can use **Edit > Edit In-Place > View Top Cell** or press the **End** key to go to the home view of the top cell. Use **View > Home** or press the **Home** key to go to the home view of the cell currently being edited in the instance hierarchy.

## Textual Editing

To edit an instance as an object, use **Edit > Object(s)—Instance**. See Instances on page 1-304 for information on this command.

# Flattening Instances and Arrays

**Cell > Flatten** removes the hierarchy of a cell. This is done by replacing all instances with the objects from the cell that they reference. The effects of this command *cannot* be reversed using the **Undo** command.

To flatten an instance by only one level, select it and use **Draw > Ungroup**. This command can be undone.