4 L-Edit Setup

Replacing the Setup

Every L-Edit design file contains basic information such as a layer list, technology settings, and module-specific options for SPR, DRC, and Extract. Collectively, this information is known as the "setup."

File > Replace Setup transfers setup information from a file (the *source* file) to the current file (the *destination* file).
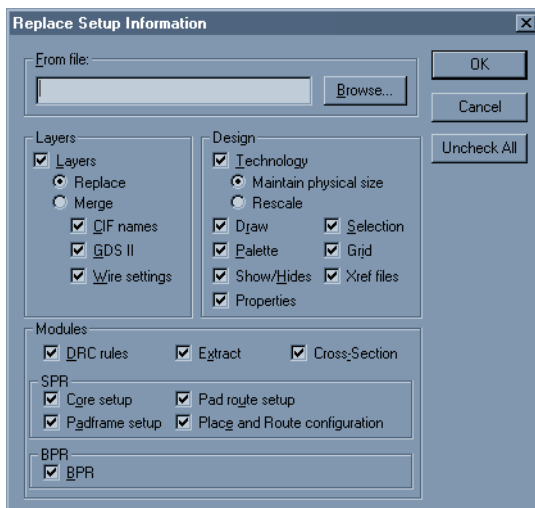
Options include:

From file	Name of the TDB or TTX file whose setup is to be imported. Click **Browse** to navigate to an existing file.
Layers	Imports layer setup from the specified file.

- **Replace** deletes the layers in the destination file and replaces them with the layers from the source file.

- **Merge** adds the layers from the source file to the list of available layers in the destination file. Source file layers not present in the destination file are appended to the layer list in the destination file. If a layer in the source file has the same name as a layer in the destination file, the position it has in the destination file is maintained. For further information, see Merging Layer Setups on page 1-87.

Additional layer-specific setup options include:

- **CIF names**
- **GDS II numbers**
- **Wire settings**

Technology

Options include:

- **Maintain physical size**—With this option, L-Edit checks all objects in all cells and unit-specific parameters entered in other dialogs to determine if the layout will be truncated when it is rescaled. L-Edit presents one warning for each cell and set of parameters if a truncation will occur. If you answer **Yes** to all the warnings, or if no truncation will occur, L-Edit rescales the design. If you answer **No** to any of the warnings, L-Edit cancels the rescaling operation**.**

- **Rescale**—L-Edit rescales the design by applying technology scaling parameters in the source file to objects in the destination file.

Draw	Transfers the parameters entered in **Setup Design—Drawing**. See Drawing Parameters on page 1-145).
Palette	Transfers the color parameters entered in **Setup Palette**. See Color Parameters on page 1-107.
Show/Hides	Transfers the view settings for grid, origin, ports, and other objects.
Properties	If checked, replaces the System and other parameters set in **File > Info—Properties**. See Properties on page 1-70).
Selection	Transfers the parameters entered in **Setup Design—Selection**. See Selection Parameters on page 1-141).
Grid	Transfers the parameters for the display grid and mouse snap grid. See Grid Parameters on page 1-138).
Xref files	If checked, replaces the TDB files that will be used as cross-reference of library files, as set in **Setup > Design—Xref files**. See Cross Reference File Designation on page 1-151).

Modules	Check the corresponding box to replace setup information for:

- **DRC rules**
- **Extract**
- **Cross-Section**
- **BPR**

SPR	Check the corresponding box to replace setup information for:

- **Core setup** (see SPR Core Setup on page 2-44)
- **Padframe setup** (see SPR Padframe Setup on page 2-68)
- **Pad route setup** (see SPR Pad Route Setup on page 2-81)
- **Place and Route configuration** (see SPR Setup on page 2-36)

Uncheck All	Deselects all options

Merging Layer Setups

When you merge layer setups, L-Edit adds source-file layers to the layer list in the destination file. If the source file has layers not present in the destination file, L-Edit appends them to the destination-file layer list. If the source file and destination file have a layer with the same name, the layer maintains its position in the destination file's layer list.

For example, a source file contains layers A, B, and C (in that order), and a destination file contains layers B, D, and E (in that order). After *replacing*, the destination file will contain layers A, B, and C. After *merging*, the destination file will contain layers B, D, E, A, and C. (The destination file's information on layer B is replaced with the source file's information on layer B.)

Note: Importing a layer setup also transfers a layer's lock status from the source file to the target file. For example, if you lock Metal1 in the source file, it will be locked in the target file. Conversely, if you lock Metal1 in the target file but unlock it in the source file, it will then be unlocked in the target file after you replace the layer setup.

Exporting the Setup

File > Export Setup opens **TTX Export**, which allows you to export setup information to a text file.
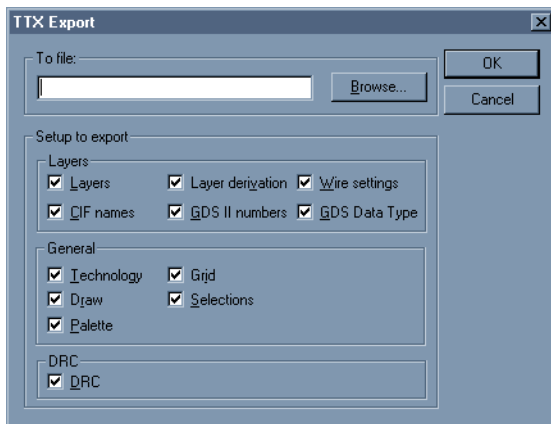
To file   Name of the destination file to receive the setup information. L-Edit will enter a default of **<*filename*>.ttx**. Click **Browse** to navigate to an existing file.

Layers	Check boxes indicate what layer setup information to save in the TTX file, including **Layers**, **Layer derivation**, **CIF names**, **GDS II numbers**, **GDS Data Type**, and **Wire settings**.
General	Check boxes indicate general setup information to save in the TTX file, including **Technology**, **Draw**, **Palette**, **Grid**, and **Selections**.
DRC	Saves design rules to the specified TTX file.

TTX File Format

Tanner Text (TTX) files contain setup information saved with **File > Export Setup**. You can read setup information from a TTX file back into L-Edit with **File > Replace Setup**.

Syntax

The TTX format is organized by categories. Default values are assumed when categories are not specified.

A formal description of TTX syntax follows the table of variables used in the description. In the following table more than one value is possible for each of the string variables. Possible values are separated by vertical bars (l). Numbers can be written in either hexadecimal or decimal format unless specified otherwise.

Variable	*Type*	*Value*
C	Numerical	Color index number from 0–15
H	Numerical	Hex number
I	Numerical	Long integer
L	Numerical	Number of locator units

Variable	Type	Value
N	Numerical	Number
P	Numerical	Number of pixels
R	Numerical	Real number
U	Numerical	Number of internal units
V	Numerical	Color value number from 0–255
boolean	String	**TRUE** | **FALSE**
cursor	String	**SNAPPING** | **SMOOTH**
end	String	**BUTT** | **ROUND** | **EXTEND**
join	String	**MITER** | **ROUND** | **BEVEL** | **LAYOUT**
layer	String	[any valid layer name]
mode	String	**set** | **clear**
name	String	[any valid name]
operation	String	**AND** | **OR**
option	String	**SELECT** | **NOT SELECT**

Variable	*Type*	*Value*
rule	String	**MIN_WIDTH** | **EXACT_WIDTH** | **OVERLAP** | **EXTENSION** | **NOT_EXISTS** | **SPACING** | **SURROUND** | **DENSITY**
style	String	**ARROWS_AT_BOTH_END** | **NO_ARROWS**
text	String	**NO_TEXT** | **CENTERED** | **AT_END_POINTS** | **AT_TICK_MARKS**
unit	String	**microns** | **millimeters** | **centimeters** | **mils** | **inches** | **lambda** | **other**

Single-line comments beginning with **//** can be placed anywhere throughout the file. Curly brackets **{ }** delimit sets of items.

```
Layer = {
        LayerName="name"
        Lock=boolean
        Hidden=boolean
        AreaCapacitance=R
        FringeCapacitance=R
        Resistivity=R
```

Contents/Search   Index

```
CIFName="name"
GDSNumber=N
ObjectPass = {
        SelectionPass = {
                ColorNumber=N
                WriteMode="mode"
                StipplePattern = {
                        H,H,H,H,H,H,H,H
                }
        }
        Pass1 = {
                ColorNumber=N
                WriteMode="mode"
                StipplePattern = {
                        H,H,H,H,H,H,H,H
                }
        }
}
PortPass = {
        SelectionPass = {
                ColorNumber=N
                WriteMode="mode"
                StipplePattern = {
                        H,H,H,H,H,H,H,H
                }
        }
        Pass1 = {
                ColorNumber=N
                WriteMode="mode"
```

```
                                StipplePattern = {
                                        H,H,H,H,H,H,H,H,H
                                }
                        }
                }
                TextPass = {
                        SelectionPass = {
                                ColorNumber=N
                                WriteMode="mode"
                                StipplePattern = {
                                        H,H,H,H,H,H,H,H,H
                                }
                        }
                        Pass1 = {
                                        ColorNumber=N
                                WriteMode="mode"
                                StipplePattern={
                                        H,H,H,H,H,H,H,H,H
                                }
                        }
                }
                Wire = {
                        Width=I
                        MiterAngle=I
                        End=" end"
                        Join=" join"
                }
        }
```

```
SpecialLayer = {
      Grid="layer"
      Dragbox="layer"
      Origin="layer"
      CellOutline="layer"
      Error="layer"
      Icon="layer"
      FirstMask="layer"
}

Drawing = {
      DefaultPortTextSize=L
      NudgeAmount=N
      RulerSettings = {
            TextSize=N
            TextLocation="text"
            EndStyle="style"
            ShowTickMarks=boolean
            MajorTick=N
            MinorTick=N
            SymmetricTickMarks=boolean
            DefaultLayer="layer"
      }
}

Palette = {
      V6StylePalette=boolean
      RGBColorC=V,V,V
}
```

```
Technology = {
        Name="name"
        Unit_name="unit"
        Int_Unit_num=N
        Int_Unit_denom=N
        Lambda_num=N
        Lambda_denom=N
}

DerivedLayer = {
        TargetLayer="layer"
        EnableEvaluation=boolean
        SourceLayer1="layer",boolean,I
        SourceLayer2="layer",boolean,I
        SourceLayer3="layer",boolean,I
        Layer1BoolLayer2="operation"
        Layer2BoolLayer3="operation"
}

DesignRuleSetup = {
        RuleSet = "name"
        Tolerance = I
}

DesignRule = {
        RuleName="name"
        Enable=boolean
        RuleType="rule"
```

```
            IgnoreCoincidences=boolean
            IgnoreIntersections=boolean
            IgnoreEnclosures=boolean
            Ignore45AcuteAngles=boolean
            Layer1Name="name"
            Layer2Name="name"
            Distance=I
            UseLocatorUnits=boolean
    }

    Grid = {
            Displayed=U
            SuppressLessThan=P
            MouseSnap=U
            CursorType="cursor"
            LocatorUnit=U
    }

    Selection = {
            SelectionRange=N
            DeselectionRange =N
            EditRange = {
                    Locator_Unit=N
                    Pixels=N
            }
            DrawnObject="option"
    }
```

Interpretation

Layer

An unlimited number of separate layer specifications may be made. The minimum requirement for a layer specification is the **LayerName**. The other parameters take default values as follows.

Parameter	*Default*	*More information*
Lock	**FALSE**	General Layer Parameters on page 1-158
Hidden	**FALSE**	General Layer Parameters on page 1-158
AreaCapacitance	**0.0**	General Layer Parameters on page 1-158. Floating-point number.
FringeCapacitance	**0.0**	General Layer Parameters on page 1-158. Floating-point number.
Resistivity	**0.0**	General Layer Parameters on page 1-158. Floating-point number.

Parameter	*Default*	*More information*
CIFName	**null**	General Layer Parameters on page 1-158 and CIF Files on page 1-199
GDSNumber	**null**	General Layer Parameters on page 1-158 and GDSII Files on page 1-211
[minimum number of passes per pass list]	**2**	General Layer Parameters on page 1-158
ColorNumber	**15**	General Layer Parameters on page 1-158
WriteMode	**SET**	General Layer Parameters on page 1-158
StipplePattern	**[empty]**	General Layer Parameters on page 1-158. **StipplePattern** is an 8x8 bit representation of the layer's stipple. Patterns are described as 8 pairs of hexadecimal numbers (for example: FF, 8B, A4) where each pair represents 8 bits. 8 such pairs represents 64 bits (8x8): the whole stipple pattern.

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Parameter	Default	More information
Width	0	Wire Styles on page 1-176
MiterAngle	90	Wire Styles on page 1-176
End	EXTEND	Wire Styles on page 1-176
Join	LAYOUT	Wire Styles on page 1-176

Special Layers

Only special layers to be modified should be named. The default values are as follows.

Parameter	Default	More information
Grid	Grid	Special Layers (page 1-182)
DragBox	Drag Box	Special Layers (page 1-182)
Origin	Origin	Special Layers (page 1-182)
CellOutline	Cell Outline	Special Layers (page 1-182)
Error	Error	Special Layers (page 1-182)
Icon	Icon	Special Layers (page 1-182)
FirstMask	Poly	Special Layers (page 1-182)

Drawing

The default settings for the file and ruler parameters are as follows.

Parameter	Default	More information
DefaultPortTextSize	5	**Design Setup** (page 1-130). Locator units.
NudgeAmount	1	**Design Setup** (page 1-130)
TextSize	5	**Design Setup** (page 1-130)
TextLocation	AT_TICK_MARKS	**Design Setup** (page 1-130)
EndStyle	NO_ARROWS	**Design Setup** (page 1-130)
ShowTickMarks	TRUE	**Design Setup** (page 1-130)
MajorTick	10	**Design Setup** (page 1-130)
MinorTick	1	**Design Setup** (page 1-130)
SymmetricTickMarks	FALSE	**Design Setup** (page 1-130)
DefaultLayer	Current Layer	**Design Setup** (page 1-130)

Palette

The color palette contains 16 different colors, with index numbers ranging from 0 to 15. The colors are made by mixing different amounts of red, blue, or green. The amount of each can be varied from 0 to 255. The defaults are as follows.

Parameter	*Default (red, blue, green)*	*More information*
V6StylePalette	**TRUE**	In previous versions of L-Edit, each color could be selected from one of 64 possible colors. In version 7, you can select each color from one of 16.7 million available.
		When a TTX file from a previous version is loaded into L-Edit, the **V6StylePalette** flag is inserted with the default value TRUE. This indicates that the earlier style palette should be used.
RGBColor0	**255, 255, 255**	**Color Parameters** (page 1-107)
RGBColor1	**85, 85, 255**	**Color Parameters** (page 1-107)
RGBColor2	**85, 255, 35**	**Color Parameters** (page 1-107)

Parameter	Default (red, blue, green)	More information
RGBColor3	**85, 170, 170**	**Color Parameters** (page 1-107)
RGBColor4	**255, 85, 85**	**Color Parameters** (page 1-107)
RGBColor5	**170, 85, 170**	**Color Parameters** (page 1-107)
RGBColor6	**170, 170, 85**	**Color Parameters** (page 1-107)
RGBColor7	**170, 170, 170**	**Color Parameters** (page 1-107)
RGBColor8	**170, 170, 170**	**Color Parameters** (page 1-107)
RGBColor9	**0, 0, 170**	**Color Parameters** (page 1-107)
RGBColor10	**0, 170, 0**	**Color Parameters** (page 1-107)
RGBColor11	**0, 85, 85**	**Color Parameters** (page 1-107)
RGBColor12	**170, 0, 0**	**Color Parameters** (page 1-107)
RGBColor13	**85, 0, 85**	**Color Parameters** (page 1-107)
RGBColor14	**85, 85, 0**	**Color Parameters** (page 1-107)
RGBColor15	**0, 0, 0**	**Color Parameters** (page 1-107)

Technology

The minimum requirement for a technology specification is the **Name**. The other parameters take default values as follows.

Parameter	*Default*	*More information*
Unit_name	**microns**	**Technology Parameters** (page 1-134).
Int_Unit_num	**1**	**Technology Parameters** (page 1-134).
Int_Unit_denom	**1000**	**Technology Parameters** (page 1-134).
Lambda_num	**1**	**Technology Parameters** (page 1-134). Required only if **Unit_name** = "lambda".
Lambda_denom	**1**	**Technology Parameters** (page 1-134). Required only if **Unit_name** = "lambda".

Generated Layers

All required source layers should be defined according to **Layer = { … }** constructs before a generated layer is defined. There are no default values for generated layers.

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Design Rules

A complete design rule specification requires a **DesignRuleSetup** definition and at least one DesignRule definition. If **UseLocatorUnits** is FALSE, then the DRC distances are specified in technology units (i.e. microns). If **UseLocatorUnits** is TRUE, then DRC distances are specified in the number of internal units it takes to represent the distance in the technology units. There are no default values for design rules.

Grid

The defaults are as follows.

Parameter	Default	More information
Displayed	1	**Grid Parameters** (page 1-138)
SuppressLessThan	8	**Grid Parameters** (page 1-138)
MouseSnap	1	**Grid Parameters** (page 1-138)
CursorType	SNAPPING	**Grid Parameters** (page 1-138)
LocatorUnit	1	**Grid Parameters** (page 1-138)

Selection

The defaults are as follows.

Parameter	*Default*	*More information*
SelectionRange	**10**	**Selection Parameters** (page 1-141)
DeselectionRange	**536870911 [maximum possible]**	**Selection Parameters** (page 1-141)
Locator_Unit	**0**	**Selection Parameters** (page 1-141)
Pixels	**2**	**Selection Parameters** (page 1-141)
DrawnObject	**SELECT**	**Selection Parameters** (page 1-141)

Color Parameters

You can display an L-Edit design file using 16, 32, 64, 128, or 256 colors in your palette. Color palette parameters are selected with the **Setup > Palette** command.
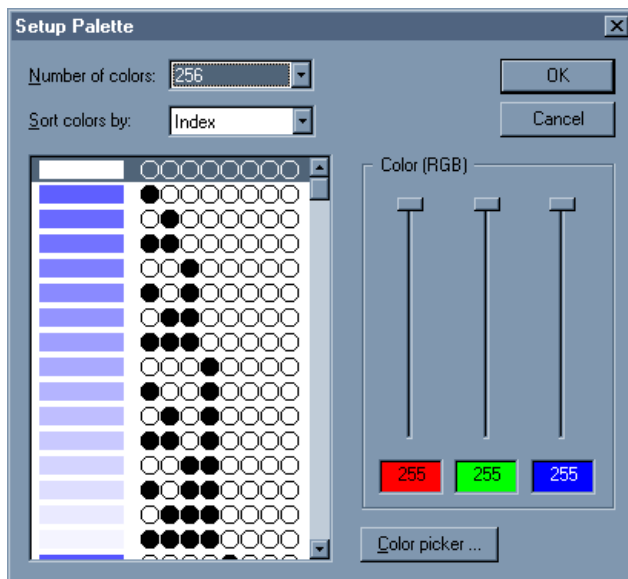
Each color has two attributes:

- A unique identifying code
- An RGB color definition

The **Setup Palette** dialog provides the following options:

Number of colors	Use this menu to select the number of colors that will be available for defining layer colors. Options are 16, 32, 64, 128, or 256 (True Color mode) colors

Sort colors by	Sets the way in which colors will be sorted in this dialog and the **Setup Layers** dialog. Options are:
	■ **Index**—sorts by index number, the binary value of a color.
	■ **Number of bits**—sorts by the number of bits used to define a color and then by index number if the number of bits set is equal.
	■ **Hue**—sorts by hue, then saturation, then luminosity, then index number.
	■ **Brightness**—sorts by luminosity in decending order, then hue, then saturation, then index number.
(left pane)	Shows a sample of each defined color and the associated 4- to 8- bit binary code used to assign a unique color index number to that color.
	The number of bits used in each color depends on the number of colors available in the file (for example, 4 bits are used in a 16 color file).

Color (RGB)	Click a color in the palette list to display the composition of a color as a function of **Red**, **Green**, and **Blue** components. Each RGB value can range from 0 to 255.
	To modify a color, use the slider controls, type a number in the red, green or blue field, or click the **Color Picker** (see below) button.
Color Picker	Opens the standard Windows **Color** dialog that allows you to select and define colors.

Application Parameters

To modify application-level settings in L-Edit, choose **Setup > Application**. Application-level settings are divided into five categories, which appear on separate tabs—**General**, **Keyboard**, **Warnings**, **UPI**, and **Rendering**.

Setup Application

Configuration files

Workgroup:

User: C:\Program Files\Tanner EDA\ledit.ini

[Browse...] [Load]

[Browse...] [Load]

General | Keyboard | Warnings | UPI | Rendering

Editing options
- [ ] Paste to cursor
- [ ] Auto-panning
- [ ] Active-push rubberbanding

Toolbars
Layer icon size: 16 pixels
Drawing mode: All Angle
- [ ] Use large buttons

Recently used file list:
Display 4 entries

Minimum zoom/selection box size: 2 pixels

Edge selection modes:
- (●) Select edges only when fully enclosed by selection box
- ( ) Select edges when partly enclosed by selection box

TDB setup path:

[Browse...]

[OK] [Cancel]

Configuration Files

Application configuration (INI) files save application settings. All tabs in **Setup Application** use the following configuration file options:

Configuration files   ASCII files containing application-wide setup information that can be edited and shared among multiple users. When both **Workgroup** and **User** (personal) files are specified, settings from the **User** file override settings in the **Workgroup** file.

Any changes made to the application-wide parameters in the **Setup Application** dialog are saved to the **User** file.

To load settings from an existing file, enter the name of the file in the **Workgroup** or **User** field or choose from available files with the **Browse** button next to the desired field. Click **Load** to load the settings into L-Edit.

Tanner INI files use the Windows INI file format and can be edited with any text editor. The following L-Edit parameters are saved in INI files:

Parameter:	*Refer to Section:*
Keyboard remapping	**Keyboard Customization** (page 1-119)
Editing options	**General** (page 1-115)
TDB setup path	**General** (page 1-115)
Toolbar settings	**General** (page 1-115)
Recently used file list	**General** (page 1-115)
Examine Xref Cell options	**Examining XrefCells** (page 1-401)
Instance rendering and cacheing	**Rendering** (page 1-125)
GDSII import and export options	**GDSII Import Options** (page 1-189) and **GDSII Export Options** (page 1-195)

Workgroup and User Configuration Files

L-Edit can load configuration information from either a **Workgroup** or a **User** file. Workgroup files are intended to be shared by multiple users; for example,

they may contain key remapping sequences that will be used by many users. User files are intended to contain preferences specific to a particular user.

Changes in the **Setup Application** dialog can only be saved to **User** configuration files. Therefore, an INI file loaded as a **Workgroup** file is protected from accidentally being changed.

General

Use the **General** tab to customize editing options, edge selection modes, toolbar display, and other general application parameters.

Options include:

Paste to cursor	When this option is checked, objects placed in the layout with **Edit > Paste** move with the pointer until any mouse button is clicked. They are then "dropped" into place at the location of the pointer. See **Paste to Cursor Feature** (page 1-365). Before objects are dropped in their final position, they can be rotated or flipped using keyboard command shortcuts. See **Reorienting** (page 1-360).

Auto-panning	When this option is checked, L-Edit automatically pans the view when the pointer touches an edge of the window during a draw, move, or edit operation.
Active-push rubberbanding	When this option is checked, it is unnecessary to hold down the mouse button during a drag. For example, when drawing a box, you can click and release the DRAW button at one corner of the box, move the pointer to the opposite corner of the box, then click the DRAW button again to complete the operation.
Layer icon size	Controls the pixel size of the icons on the Layer palette.
Drawing mode	Sets the default display of drawing tools on the Drawing toolbar. When **Orthogonal** or **45 Degrees** is chosen, only those tools fitting that description will be displayed. When **All Angle** is selected, all tools are displayed.
Use large buttons	Increases the size of all toolbar buttons by 50 percent.
Recently used file list	Controls the number of recently used files displayed in the **File** menu.

Minimum zoom/selection box size	Specifies the minimum area, in pixels, of a zoom or selection box. See Setting Zoom/Selection Box Size, below.
Selection modes	Governs edge selection behavior. Options include:
	▪ **Select edges only when fully enclosed by selection box**
	▪ **Select edges when partly enclosed by selection box**
	See Setting Zoom/Selection Box Size, below.
TDB setup path	Predefined directories for TDB setup files. TDB files in these directories are listed in the **Copy TDB setup from file** field in the **File > New** and **File > Import Mask Data** dialogs.

Setting Zoom/Selection Box Size

The zoom/selection box is a construct L-Edit uses in zooming to a specified view and selecting objects.

A zoom box defines the boundaries of the view during a zoom operation. When you choose **View > Zoom** and draw a box, for example, L-Edit zooms to a view

corresponding to that box. If you choose **Zoom > View** and simply click the mouse, L-Edit magnifies the area around the pointer by a factor of two.

A selection box specifies an area within which L-Edit selects objects. When you drag a selection box around a polygon or wire, for example, L-Edit selects all or part of that object, depending on the edge selection mode specified in the dialog **Setup > Application—General**. If you simply click the mouse repeatedly without moving it, L-Edit selects objects in cycle, as described in Cycle Selection on page 1-340.

If your mouse is not perfectly stable, you can use the option **Minimum zoom/ selection box size** to specify the minimum size of this box. Use a relatively small value, such as 2 or 3 pixels, to prevent L-Edit from misinterpreting small, accidental mouse movements as a zoom or selection box.

Keyboard Customization

Use the **Keyboard** tab to customize keyboard shortcuts.
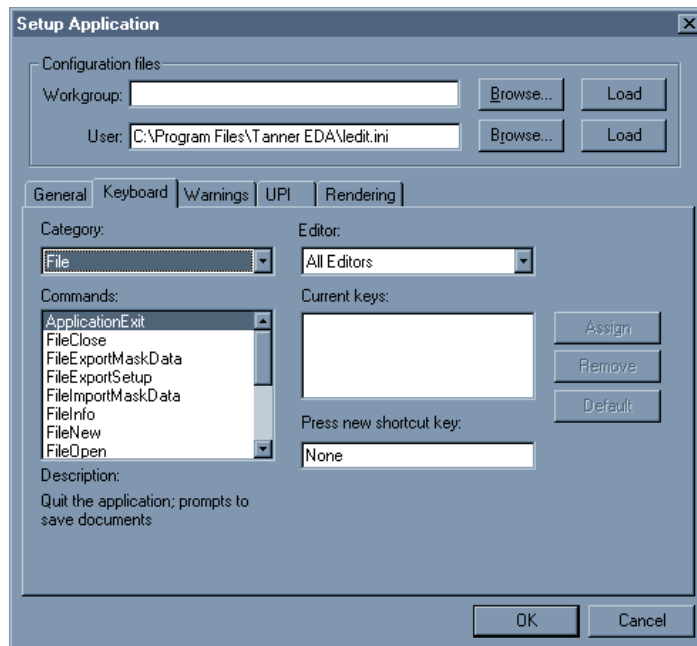
Options include:

Category	Command categories corresponding to L-Edit menu items. To select a category, highlight an item in the drop-down list.
Editor	L-Edit has two editors, one for layout files and one for text files. Each editor has its own set of commands and keyboard shortcuts. To remap shortcut keys for a specific editor, select the desired choice from the drop-down list. Options include: **All Editors**, **Layout**, and **Text**.
Commands	The set of commands for the selected category. Highlight a command from the list to select it. Additional commands may be viewed by moving the scrollbar up or down.
Description	A description of the command highlighted in the **Commands** list.
Current keys	The current shortcut key combination for the command highlighted in the **Commands** list. To delete a shortcut, highlight the shortcut and click **Remove**.

Press new shortcut key	With the cursor in the field, press the desired shortcut on the keyboard, which will then be textually represented in the field. Click **Assign** to register the new shortcut.
Default	Reassigns all shortcut key assignments in the current editor to their default settings.

You can write your keyboard assignments to a workgroup or user configuration file. Select a file using the appropriate **Browse** button in the top of the dialog. Then press **Shift+Enter**, or hold the **Shift** key while clicking **OK**. L-Edit will write the keyboard assignments to the bottom of the designated file.

Warnings

Use the **Warnings** tab to enable and disable warnings and explanations which you may encounter while editing a design file.
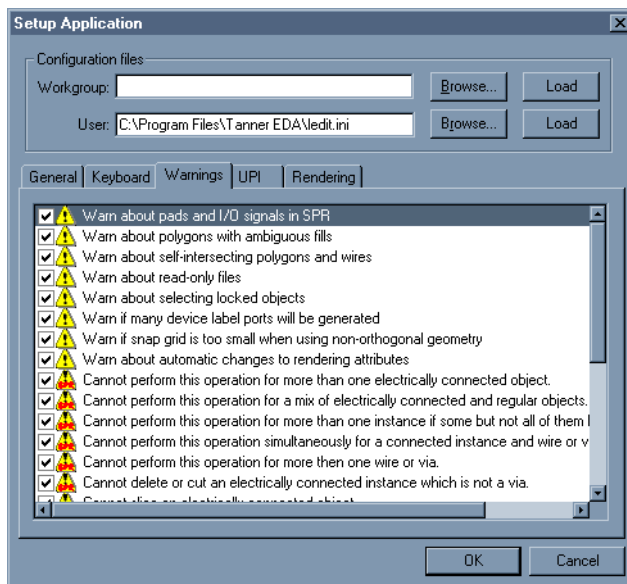
UPI

Choosing the **UPI** tab in the **Setup Application** dialog allows you to set a path to the header files that L-Edit uses to interpret a macro. This dialog is also used to set a path to the log file where UPI writes macro errors.
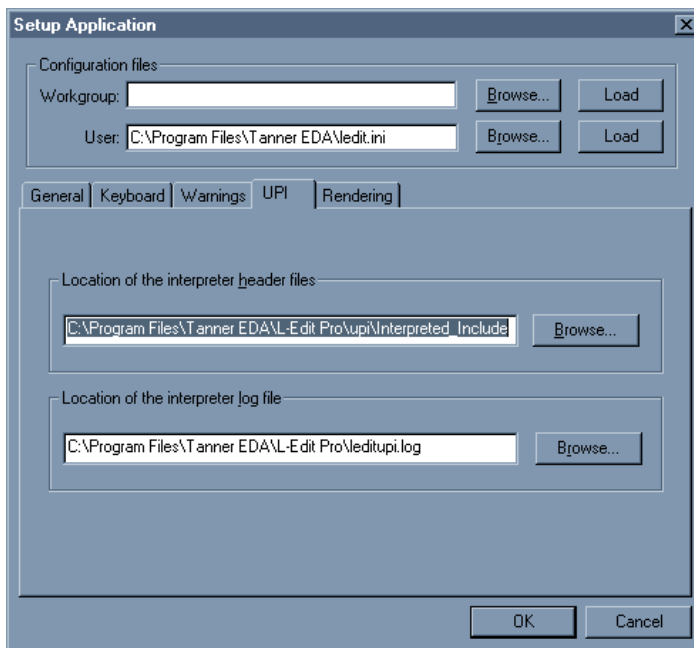
Options include:

Location of the interpreter header files	The complete path of the directory containing the L-Edit interpreter header files. Clicking **Browse** next to this field calls a standard Windows file browser.
Location of the interpreter log file	The name of the log file to which macro errors will be written. Clicking **Browse** next to this field calls a standard Windows file browser. Be sure you have write permission to the directory where you create your log file. Log files are only used when running interpreted macros.

Rendering

Use the **Rendering** tab to establish basic display behavior.

Setup Application

Configuration files

Workgroup: [   ]   Browse...   Load

User: [C:\Program Files\Tanner EDA\ledit.ini]   Browse...   Load

General | Keyboard | Warnings | UPI | Rendering |

☑ Hide instance insides if less than

[5] ⬍ Horizontal or

[5] ⬍ Vertical pixels

☑ Cache instances smaller than

[700] ⬍ Pixels

☑ Hide objects smaller than

[5] ⬍ Pixels

Advanced performance settings...

Redraw

◉ All windows

○ Active window only

☐ Fill objects when editing/drawing

☑ Rendering can be interrupted

☑ Show design while rendering

First time after: [100] msec.

Then every: [500] msec.

OK   Cancel

Hide instance insides if less than	Defines the minimum size (in pixels) that an instance must have to be completely drawn on the screen. If an instance is smaller than the **Horizontal** parameter *or* the **Vertical** parameter, it is drawn in outline mode—its insides are not shown.
	Suppressing the display of instance insides can enhance screen redraw times and clarify the layout if the screen is zoomed out to a relatively small magnification.
Hide objects smaller than	When checked, defines an approximate minimum size (in pixels) that an object must have to be drawn on the screen.
Cache instances smaller than	When checked, defines an approximate minimum size (in pixels) that an instance must have to be cached. Cached instances are rendered in memory first and can be subsequently redrawn at much higher speeds than non-cached instances.

Rendering can be interrupted	When checked, rendering can be interrupted with any mouse click or key stoke so that a full redraw does not have to be completed between each operation.
Redraw	Choose **All windows** to redraw, for example, instances of a cell in other windows when the cell itself is modified, or **Active window** to redraw just what is displayed in the currently active window.
Fill objects when editing/drawing	Renders objects in outline mode when unchecked.
Advanced performance settings	Opens **Advanced Performance Settings,** which allows you to set and test system performance options that affect L-Edit rendering speed. (See Advanced Performance Settings on page 1-128.)

Advanced Performance Settings

Use CPU for color mixing Affects rendering performance by allowing you to process color mixing on your CPU or video card.

L-Edit mixes layer colors to produce the proper color display where objects overlap. When relatively few objects are drawn on a relatively large number of layers, performance can degrade.

Unless you have very powerful video card, this option should be checked to performe color mixing on the CPU.

Use MMX technology If the CPU is used for color mixing, MMX technology generally provides optimal performance. However, ocassionally an unusual system configuration produces better performance with this option disabled.

Use PatBlt function for patterns	L-Edit uses a fast Win32 function PatBlt when rendering layers with objects having patterned fill or outlines. However, video driver manufacturers implement this function unpredictably. If you find that patterns are not rendered correctly when this option checked, uncheck it. Note that for Windows 95/98/ME it is recommended that this option be disabled.
Default	Restore the default settings, which are best for most system configurations.
Test	Perfoms a rendering test by measuring how long it takes to redraw the top layout window ten times. Use this test to analyse different performance settings.

Design Setup

To modify design-level settings in L-Edit, choose **Setup > Design**. This command opens the **Design Setup** dialog, which has tabs that allow you to manipulate design parameters in five catagories:

- **Technology (**Technology Parameters on page 1-134**)**
- **Grid (**Grid Parameters on page 1-138**)**
- **Selection (**Selection Parameters on page 1-141**)**
- **Drawing (**Drawing Parameters on page 1-145**)**
- **Curves (**Curve Approximation Parameters on page 1-148**)**
- **Xref files (**Cross Reference File Designation on page 1-151**)**

Internal Units and Technology Units

Before beginning your design, you should define the relation between internal units and *physical*, or *technology*, units, as it will determine the extent of the layout area and the smallest object that can be drawn. This relation is also critical when you replace your design setup or export a design to CIF or GDSII format. Defining this relationship sets the scale of the design file.

The L-Edit layout area extends from -536,870,912 to +536,870,912 internal units in both the *x*- (horizontal) and *y*- (vertical) directions. Thus, if 1 internal unit =

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0.001 micron, the largest possible design is 1,073,741 microns (almost 42.3 inches) on a side. Similarly, the smallest dimension L-Edit can define is 1 internal unit. If 1 internal unit = 0.001 micron, the smallest possible feature size would be 0.001 micron. (In practical terms, of course, 0.001 micron is an unrealistically small feature size.)

In practice, you might also wish to adjust other settings based on your minimum feature size. If you use the display grid as a visual aid while drawing, you may wish to adjust its spacing. To achieve adequate resolution, you may wish to adjust the spacing of the mouse snap grid or turn it off altogether.

To adjust these parameters, open the **Setup Design** dialog, **Grid** tab. Define an appropriate relation between locator units and internal units. If your smallest feature is 0.25 micron, for example, and your design is scaled so that 1 internal unit = 0.001 micron, define a relationship of 1 locator unit = 1,000 internal units. Then set the display grid to 1 locator unit and the mouse snap grid to 0.25 locator unit. You will be able to draw features of 0.25 micron using the display grid and the mouse snap grid as guides.

See Grid Parameters on page 1-138 for further information on setting the display grid and the mouse snap grid.

Rescaling by Redefining Technology Units

The following examples illustrate how L-Edit performs rescaling.

Example 1: You are designing for a 2-micron CMOS process (where transistor gate lengths must be at least 2 microns across). Using **Microns** as the technology unit, with 1 internal unit = 1/1 microns in the **Technology** tab and 1 locator unit = 1 internal unit in the **Grid** tab, you have drawn a 10x10 rectangle—that is, a rectangle with 10 locator units = 10 microns on a side.

You now decide that you would rather fabricate your design using a 1-micron CMOS process (where transistor gate lengths must be at least 1 micron across). So you change the definition of a locator unit by changing 1 internal unit = 1/2 micron in the **Technology** tab.

However, you select the **Rescale the design** option. The result is that the original rectangle is still 10 locator units on a side, but since you have changed the definition of a locator unit (1 locator unit = 1/2 micron), the rectangle is only 5 microns on a side. You have effectively scaled the rectangle by a factor of 1/2.

Example 2: Again, using **Microns** as the technology unit, with 1 internal unit = 1/1 microns and 1 locator unit = 1 internal unit, you have drawn a 10x10 rectangle—that is, a rectangle 10 locator units = 10 microns on a side.

Now you discover that you need to draw a rectangle only 1/2 micron square. This cannot be done with the current technology settings, since objects cannot be drawn with dimensions smaller than 1 internal unit. You change the definition of an internal unit (1 locator unit = 1/2 micron) by making 1 internal unit = 1/2 micron in the **Technology** tab.

This time you select the **Maintain physical size of objects** option. The result is that the original rectangle is now 20 locator units on a side, but it is still only 10 microns on a side.

Adapting the Design for DRC

When you rescale a design, you must adapt it so that design rules are accurately applied in terms of the design scale.

For maximum flexibility, use an artificial unit such as lambda as the technology unit in your design and as the unit of measurement in your design rules. You can define the relation between lambda and internal units in the **Setup Design** dialog, **Technology** tab.

If you rescale the design (by altering the relation of internal units and lambda), you can easily apply appropriate design rules by redefining the ratio of lambda to technology units.

Technology Parameters

To specify technology parameters, choose **Setup > Design**. The **Setup Design** dialog with the **Technology** tab displayed appears:

Options include:

Technology name	Used to determine whether two design files are compatible. If you attempt to copy a cell from a file with a technology name different from that of the current cell, L-Edit presents a warning.
Technology units	A technology is described by a specific unit of measurement. Select one of the predefined units (**Microns**, **Mils**, **Millimeters**, **Centimeters**, or **Inches**), or a custom unit (**Other**). If you choose a custom unit, you must also specify its equivalent in microns and in internal units (for CIF/GDS II output, design rule checking, and other purposes) under **Technology Setup**. See CIF Files on page 1-199 or GDSII Files on page 1-211 for more information.

Technology setup - Maintain physical size of objects

Available only when you change the relationship between technology units and internal units. With this option, L-Edit checks all objects in all cells and unit-specific parameters entered in other dialogs to determine if the layout will be truncated when it is rescaled. All coordinates and dimensions of objects are stored in internal units. The internal units are rescaled to maintain the physical size of the object based on the previous relationship of physical units to internal units. L-Edit will present one warning for each cell and set of parameters if a truncation will occur. If **Yes** is answered to all the warnings, or if no truncation will occur, L-Edit rescales the design. If **No** is answered to any of the warnings, L-Edit cancels the rescaling operation and redisplays the **Technology** dialog.

Technology setup - Rescale the design

Available only when you change the relationship between technology units and internal units. With this option, L-Edit rescales all objects in all cells and unit-specific parameters entered in other dialogs in accordance with the newly defined relationship between internal units and technology units relationship. The internal unit representation of all coordinates and dimension of objects does not change. However, the relationship of internal units to physical units changes, effectively rescaling the design.

Technology setup - Technology Units per Internal Unit

The relationship defined between internal units and physical units. Also, for custom units, the relationship defined between microns and the custom unit.

For example, you might choose to define one internal unit as one foot (= 12 inches = 304800 microns). Under **Technology Units**, click **Other** and enter "Foot" as the name of the unit. Then, under **Technology Setup**, define **1 Internal Unit = 1/1 Foot** and **1 Foot = 304800/ 1 Microns**.

Grid Parameters

To aid the viewing, drawing, and editing of objects, L-Edit provides three independent *grids*—the displayed grid, the mouse snap grid, and the locator coordinate system—each of which divides the layout area into equal squares whose corners are gridpoints.

- The display grid provides a set of convenient locating points.

- The mouse snap grid determines the pointer's freedom of movement.

- The locator coordinate system are the units in which positions, sizes, and distances are reported.

Grid parameters are specified on the **Grid** tab on the **Setup Design** dialog.

Setup Design

Technology | Grid | Selection | Drawing | Curves

Grid display

Displayed grid: `1.000`   Locator Units

Suppress grid less than: `8`   Pixels

Mouse grid

Cursor type: ⦿ Snapping   ○ Smooth

Mouse snap grid: `0.500`   Locator Units

Locator Units

One Locator Unit: `1000`   Internal Units

OK   Cancel
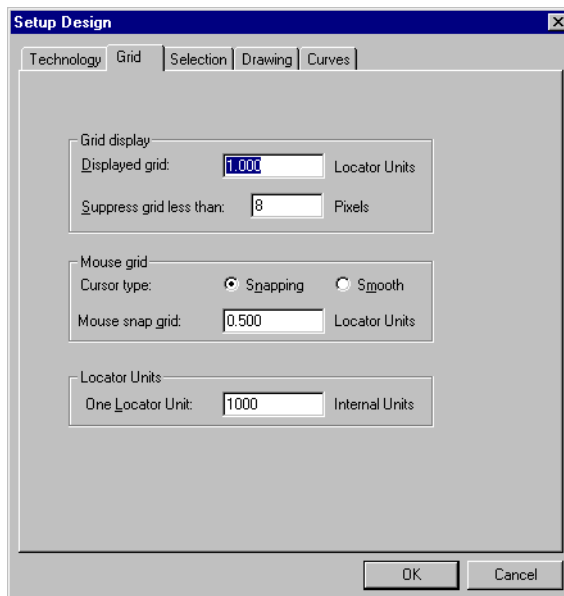
Options include:

Displayed grid	The absolute spacing of the displayed grid. The value entered in this field is the length, in locator units, of a grid square side.
Suppress grid less than	The apparent spacing of the displayed grid varies with the magnification of the Layout Area. If the number of screen pixels per grid square side falls below the value entered in this field, then the grid is hidden.
Cursor type	▪ **Snapping**—Causes the cursor to snap to the gridpoints specified in **Mouse snap grid**. ▪ **Smooth**—Allows the cursor to be unconstrained.
Mouse snap grid	Absolute spacing of the mouse snap grid. The value entered in this field is the length, in internal units, of a grid square side.
One Locator Unit	The value entered in this field is the number of internal units equivalent to one locator unit. locator units are the units in which distances and sizes are reported. The status bar and locator show dimensions in locator units.

Selection Parameters

You can modify object selection parameters in the **Setup Design—Selection** dialog.
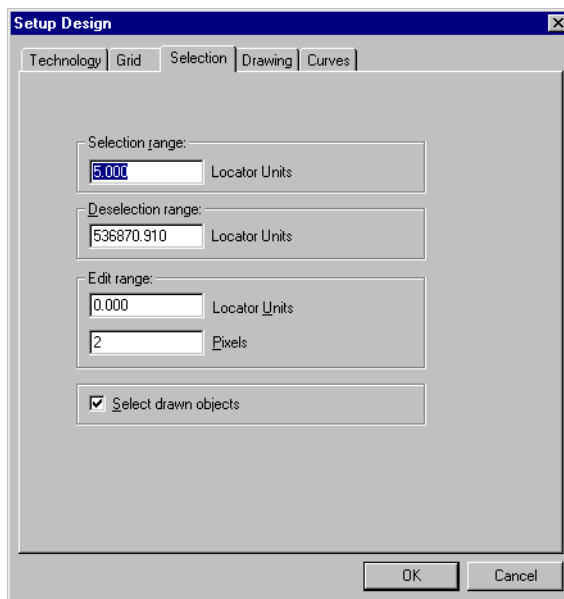
Options include:

Selection range	A positive integer *s* such that: if the pointer is *outside* an object but is still within *s* locator units of any of the object's edges, then the object can still be selected. See Selection and Deselection Ranges, below.
Deselection range	A positive integer *d* such that: if a mouse button is clicked (for example, to initiate a move, edit, or copy operation) when the distance between the pointer and a selected object is greater than *d* locator units, then the selected object is *deselected*. The deselection range is set by default to the largest possible number (to indicate infinity), so that a selected object is never automatically deselected.
Edit range	A positive integer *e* such that: if the pointer is within *e* locator units of an edge or vertex of the selected object, then clicking the **Move-Edit** mouse button will execute the edit operation; otherwise it is a move operation. Two numbers are supplied: one in locator units, the other in pixels. *e* takes the value that results in a larger on-screen distance.

Select drawn objects   Instructs L-Edit to automatically selects an object after it is created. This is useful for designers who like to position or edit objects after creating them instead of while drawing them.

Selection and Deselection Ranges

The values set for **Selection range** and **Deselection range** govern the operation of the implicit selection feature (see Implicit Selection on page 1-339). When you click the MOVE-EDIT mouse button, L-Edit selects geometry within the selection range and deselects geometry outside the deselection range. In the following illustration, the selection range is bounded by a heavy black outline (not drawn to scale).
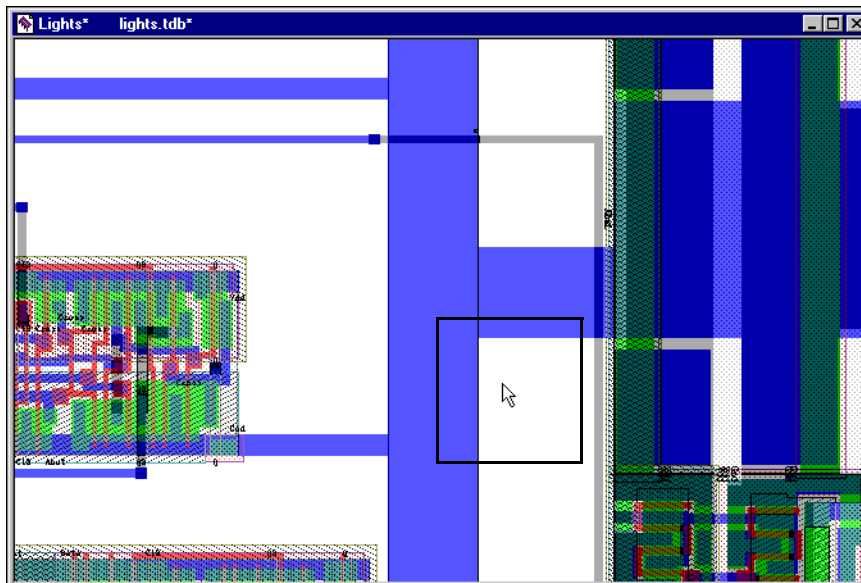
When multiple objects are within the selection range, L-Edit determines which object to select using the following priority: (1) objects the pointer is *inside*, ordered by the closest edge; (2) objects the pointer is *outside*, yet still within the selection range, ordered by the closest edge.

Drawing Parameters

You can modify drawing parameters in the **Setup Design—Drawing** dialog.
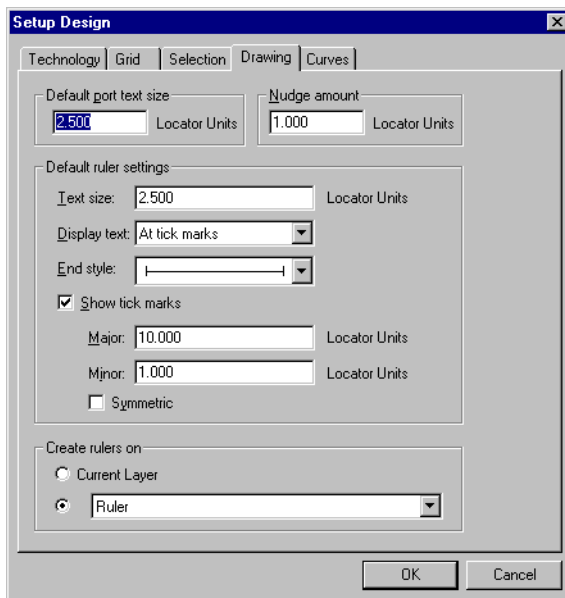
Options include:

Default port text size	Default text size in locator units for ports. (There is a UPI macro that will scale all port's text size; see the upilib.wri file in the upilib folder of your L-Edit installation directory for documentation.)
Nudge amount	Amount (in locator units) to move objects during the nudge operation.
Text size	The default letter height, in locator units, for text associated with rulers.
Display text	Ruler text can be displayed in one of four ways: **No text**, **Centered**, **At end points**, or **At tick marks**. Select the desired option from the drop-down list.
End style	Ruler lines contain one of two end styles: arrows or tick marks. Highlight the illustration in the drop-down list to select the default end style.

Show tick marks	Toggles the display of tick marks. To change the position of **Major** and **Minor** tick marks (in locator units), type the desired spacing in the appropriate field. **Major** tick marks are twice as long as **Minor**.
Symmetric	When this box is checked, tick marks extend above and below the ruler.
Create rulers on	The default layer for rulers. The **Current Layer** option places rulers on whichever layer is currently selected on the Layer Palette. To set rulers to a specific layer, click the second option button and select a layer from the drop-down list.

Curve Approximation Parameters

Use **Setup > Design—Curves** to set parameters for approximating curves. L-Edit uses the parameters for exporting to CIF and GDSII, saving files in TDB version 7 format, and the **Draw > Curves > Approximate** command.
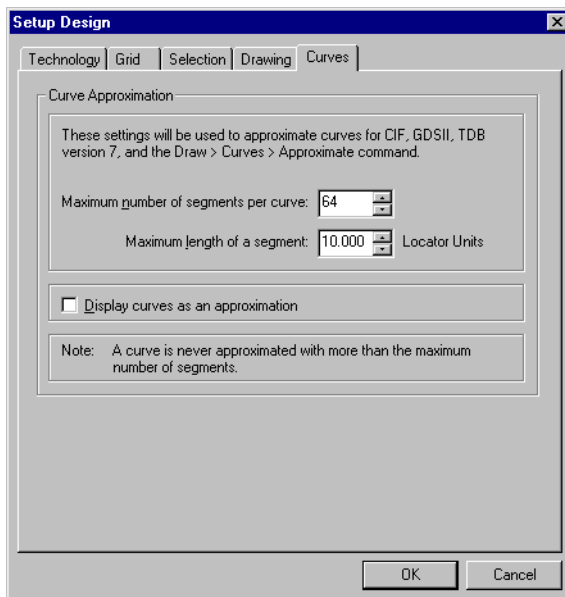
Options include:

Maximum number of segments per curve	The maximum number of segments L-Edit will use to approximate the curve. Curves will not be approximated with more than the maximum number of segments. Range: 4-1024.
Maximum length of a segment	The maximum length of a single segment in the curve approximation, in locator units.
Display curves as an approximation	Display curves as a series of segments rather than as smooth curves.

When L-Edit approximates a curve, it it first attempts to use segments within the length specified in the **Maximum length of a segment** field. If the number of segments exceeds the number specified in the **Maximum number of segments per curve** field, L-Edit approximates the curve with the maximum number of segments and ignores the specified maximum length per segment.

For example, the maximum length of a segment may be 2 and the maximum number of segments per curve is 6. For a particular curve, segments with a length of 2 may require a total of 7 segments to complete the curve. In that case, L-Edit will complete the approximation with 6 segments of equal length, each 2.3 locator units long. L-Edit allows a range between 4 and 1024 segments per curve.

The information in the **Setup Design—Curves** dialog is saved in the TDB file and in your computer's registry. When you create a new file, L-Edit uses the information from the registry as default values for the fields.

Cross Reference File Designation

Use **Setup > Design—Xref files** to list the files you want to use as cross reference or library files.
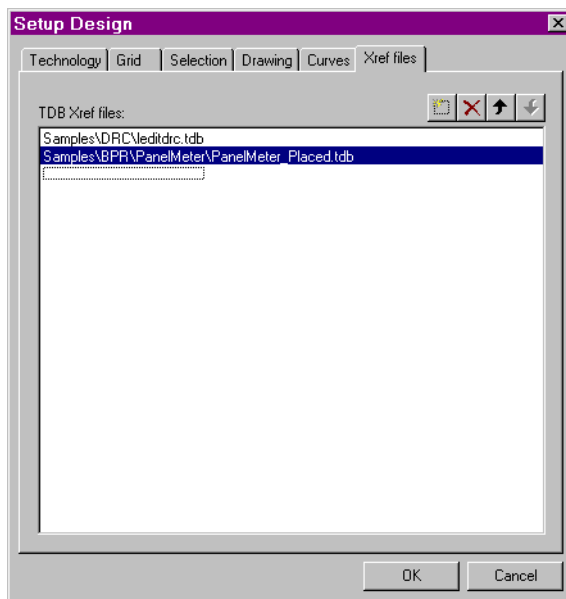
Options include:

TDB Xref files

Enter a path and file name by using a slow click (click and hold the mouse button briefly before releasing) within the entry area to initiate edit mode. If you use relative paths, they will be relative to the location of the design file in which you are working. To browse for a file, click the ellipsis button (...).

The order in which you list files in this dialog is critical. L-Edit will check files for cross-referenced cells in this order during GDSII import. To speed L-Edit processing, list files with the most cross referenced cells higher in this list. Files are also listed in this order in the **Cell Instance** dialog and the **Design Navigator**.

Double-clicking on a file name opens the **Properties** window for that file.

The file list has four buttons:

Adds a new file to the list and puts you in edit mode for that file.

✕	Deletes the selected Xref library file from the list.
↑	Moves the selected Xref library file up on the list.
↓	Moves the selected Xref library file down on the list.

To cross-reference cells when exporting to GDSII, you need to first specify which files will be library files by listing them in the **Setup > Design—Xref files** dialog. A library file, called an **Xref file** in L-Edit terminology, is a TDB file containing cells which are referenced from another file.

Once a file is linked to a design, its cells can be cross-referenced using the **Cell Instance** dialog or by dragging it from the **Design Navigator** and dropping it into your layout. The cells in an Xref file are called **XrefCells**.

Xref files names and paths are stored in your TDB design file, and are transferred during a **File > Import Mask Data**, **File > Replace Setup** or **File > New** operation.

Library files can also be referenced when you import a GDSII file (see GDSII Import Options on page 1-189).

Layer Setup

An L-Edit setup contains an ordered list of layers, shown as icons in the layer palette.

Icons in the layer palette are displayed in the same order as they are listed in the **Setup Layers** dialog, arranged from top to bottom and left to right.

To edit the layer structure in the active file, open the **Setup Layers** dialog by choosing **Setup > Layers** or double-clicking anywhere on the layer palette.
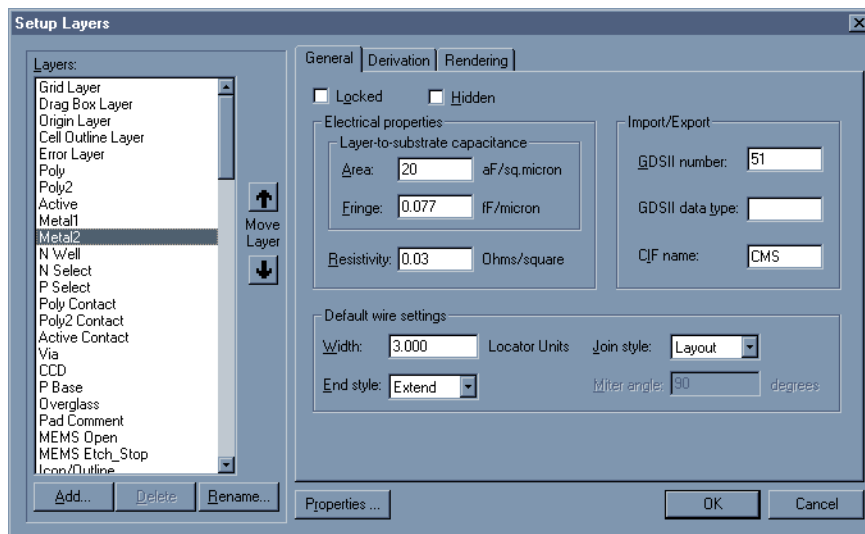
The **Layers** list on the left shows all the defined layers in the active file.

Note: There is a UPI macro that allows you to save and restore layer settings; see the upilib.wri file in the upilib folder of your L-Edit installation directory for documentation.

To Add a New Layer:

☑   Click **Add layer**. A layer named "**New Layer [*n*]**" will be added to the layer list, with all values in each of the three **Setup Layers** cleared.

☑   Click **Rename** to edit the layer name. Note that no two layers can have the same name. Generated layers must be positioned in the list below the layers from which they are derived.

Options for Defining Layers

There are three tabs in the **Setup Layers** dialog: **General**, **Derivation**, and **Rendering**. The following common controls for the layer list are available with each of these tabs:

Add Layer	To add a layer to the list, click the **Add layer** button. A **New Layer [*n*]** (where [*n*] is the number of the new layer) will be added to the layer list; this name can be edited.

Move Layer	Click on the up or down arrow to reposition the highlighted layer in the list.
Delete Layer	To delete a layer, highlight the layer in the list and click **Delete layer**. A layer can only be deleted if it contains no geometry.
Rename	Opens a dialog that allows you to enter a new name for the highlighted layer.
Properties	Opens the **Properties** dialog, where you can define and attach any type of property characteristics.

General Layer Parameters

The **General** tab, shown in the previous figure, allows you to set the following layer properties:

Locked	When this box is checked, geometry on a layer cannot be drawn, moved, or edited.
Hidden	When this box is checked, the layer is hidden (not displayed).

Layer-to-substrate capacitance	Specifies the **Area** capacitance between the layer and the substrate (in aF/sq. micron), and the **Fringe** capacitance (in fF/micron).
Resistivity	Specify the resistivity (resistance per square unit area) of the layer material in Ohms/square.
Import/Export	To edit the import/export parameters of the selected layer, enter values in these fields as appropriate:

- **GDSII number**—an integer that indicates the GDSII layer number

- **GDSII data type**—an integer that can be used in combination with the **GDSII number** to identify an additional layer. For further information, see GDSII Data Type on page 1-215.

- **CIF name**

Default wire settings	Set the default **Width** (in locator units), **End style**, and **Join style** for the layer's wire settings. See End Styles and Join Styles on page 1-178 for more information on wire settings.

Derivation Layer Parameters

The **Derivation** tab allows you to define new layers that are derived from existing ones using logical and selective operations. Derivation settings are discussed in Generating Layers on page 1-435..
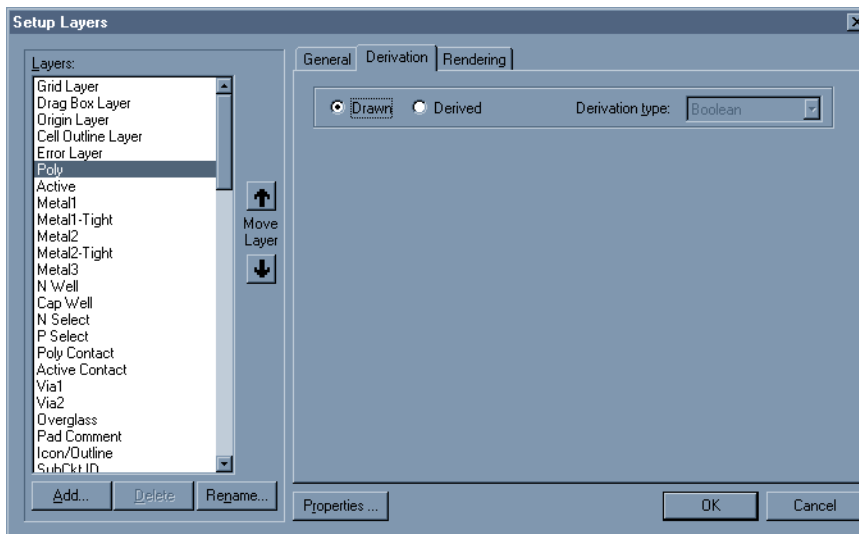
Rendering Layer Parameters

The options on the **Rendering** tab control layer appearance.
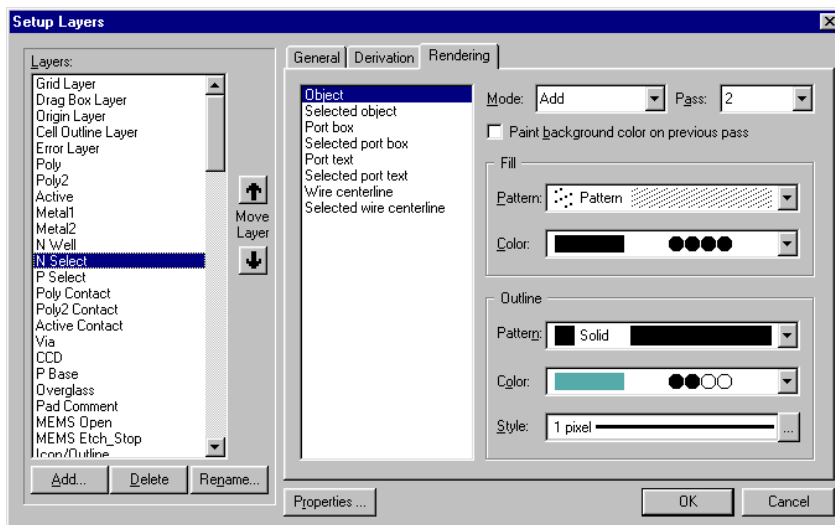
A layer's appearance is determined by when it is drawn with respect to the other layers in the design—its **pass** value, and whether its color is added, subtracted, or replaces the colors of the layers that are drawn before it—its **mode**.

For each layer, you can also specify a color and a pattern for the fill and outline of drawn elements in normal state and in selected state. The elements for which color and pattern can be set are:

- Object
- Selected object
- Port box
- Selected port box
- Port text
- Selected port text
- Wire centerline
- Selected wire centerline

Note: Wire centerlines, whether or not the wire is selected, are always rendered in a 1 pixel wide solid pattern.

Rendering options include:

Mode   Use **Mode** to control how a layer affects the appearance of the layers with which it overlaps. Options are:

- **Add**—use a logical OR operation

- **Subtract**—use a logical AND NOT operation

- **Paint**—use a logical OVERWRITE operation

(See Mode on page 1-165 for more information.)

Pass   Use **Pass** to control the order in which layers are rendered. Pass values range from 1 to 10, where 1 is rendered first and 10 is rendered last. (See Pass on page 1-172 for more information.)

Paint background color on previous pass	Use this option to properly render stacked vias. When this box is checked, the layout background color clears all layers with a pass value less than that of the active layer prior to rendering of a patterned object.
	This option is available only for non-selected pbjects with a non-solid fill, for layers with a pass value greater than one.
Pattern (for **Fill** and **Outline**)	Select one of the predefined patterns from the drop-down list or use **Other** to create one of your own. (See Pattern on page 1-172 for more information.)
	None fills in none of the pixel elements used to create a pattern, **Solid** fills them all in.
Color (for **Fill** and **Outline**)	To set rendering color, click one of the bars or bit codes in the drop-down list. (See Color on page 1-173.)
	(The number of colors available and how they are sorted is controlled in the **Setup Palette** dialog. See Color Parameters on page 1-107 for more information.)

Style	Click on the ellipsis (**…**) to set the outline style
(for **Outline** only)	for the selected element. L-Edit opens the
	Outline Style dialog where you can specify a
	line style, line width, and the line width unit of
	measure. (See .)

Mode

L-Edit objects can be rendered in one of three drawing modes: **Paint**, **Add**, or **Subtract**. These different modes are used to control how layers are rendered, particularly when they overlap.
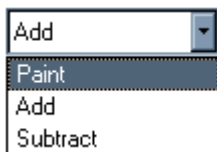
The drawing mode applies to fill, or to outline if the layer has no fill. If a layer has fill and outline, the outline is always rendered in **Paint** mode, no matter which mode is selected for the fill. Objects that are selected are always rendered in **Paint** mode and cannot be set to another mode.

Object colors and patterns are combined as layers are drawn. Overlapping objects produce entirely new colors and patterns. This mechanism ensures that regions of overlap are displayed in a meaningful way without obscuring the presence of other objects.

In **Paint** mode, the color of regions of overlap and all drawn objects is determined by a logical OVERWRITE operation. The bit values of a layer always overwrite the bit values of the layers drawn before it (i.e. with equal or lower **Pass** values). For layers with the same pass value, rendering proceeds in layer list order.

However, if the **Paint background color on previous pass** checkbox is enabled, a layer is rendered in two passes. The first pass clears the layer with a pass value lower than that of the active layer and replaces it with the background color of the layout window. The second pass then draws the stipple pattern for the layer as usual. This option is only available to layers with a non-solid fill pattern and a pass value greater than one.

For example, in the illustration below, both via layers are set to paint the background on previous layer passes. Layer **Via 2** (black stipple pattern C, with a pass value higher than the others) is rendered over the layer **Poly** (red, with a pass

value lower than Via 2) and Via 1 (blue stipple pattern R, with a pass value lower than via 2) layers.
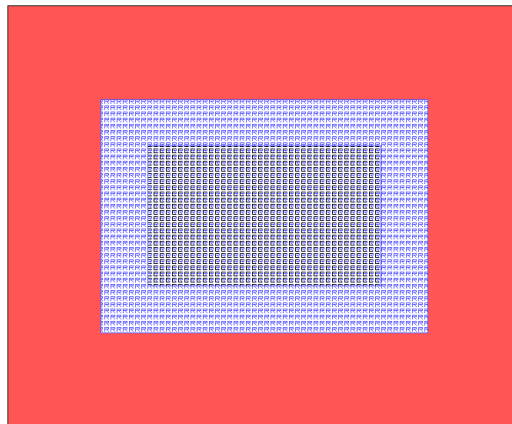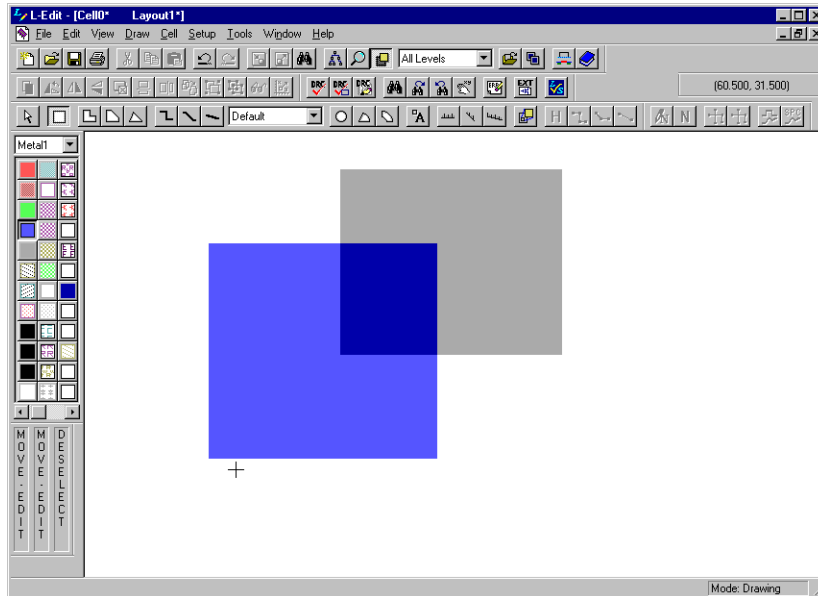

In **Add** mode, the color of regions of overlap is determined by a logical OR between the bits of the color code for each layer. (This corresponds to the "set" mode in previous versions of L-Edit.)

The bit values of an **Add** layer are added to the bit values of those layers drawn before it.

For example, if Metal1 is [████████   ●○○○   ▾] with a **Pass** value of 1

and Metal2 is [████████   ○○○●   ▾] with a **Pass** value of 2,

their overlapping areas will be rendered as [████████   ●○○●   ▾] in
Add mode, as shown in the figure below.

The region of Metal1 and Metal2 overlap is shown by a third darker color created by the logical OR (**Add**) operation.

In **Subtract** mode, the color of regions of overlap is determined by a logical AND NOT. The *complement* of the bit values of a **Subtract** layer are subtracted from the bit values of those layers drawn before it. (This corresponds to the "clear" mode in previous version of L-Edit.)

Note that a subtract layer "clears" colors rendered before it but has no effect on the appearance of objects on layers rendered after it.

For example, if Metal1 is [blue] ●○○○ with a **Pass** value of 1 and **Add** mode,

P Select is [red] ○○●○ with a **Pass** value of 2 and **Add** mode, and

Via1 is [black] ●●●● with a **Pass** value of 2 and **Subtract** mode, then

objects on Via1 will be rendered as ○○○○ , as shown in the following illustration.

To define vias that appear transparent, the via layer **Pass** value must be higher than that of the metal layers (2 or higher), so that the via layer color operation will affect them, or the via layer should come after the metal layers in the layer list. The mode should be **Subtract** and the color 1111 (black). With a color bit code of 1111, subtract mode yields the logical operation AND NOT of 1111—or the logical AND of 0000, the complement of 1111. The logical AND of 0000 and any other color will be 0000, so the drawn color will always be 0000.

A box on Via1 layer has the same color everywhere it overlaps other layers, because its bits are subtracting all previously rendered bits.
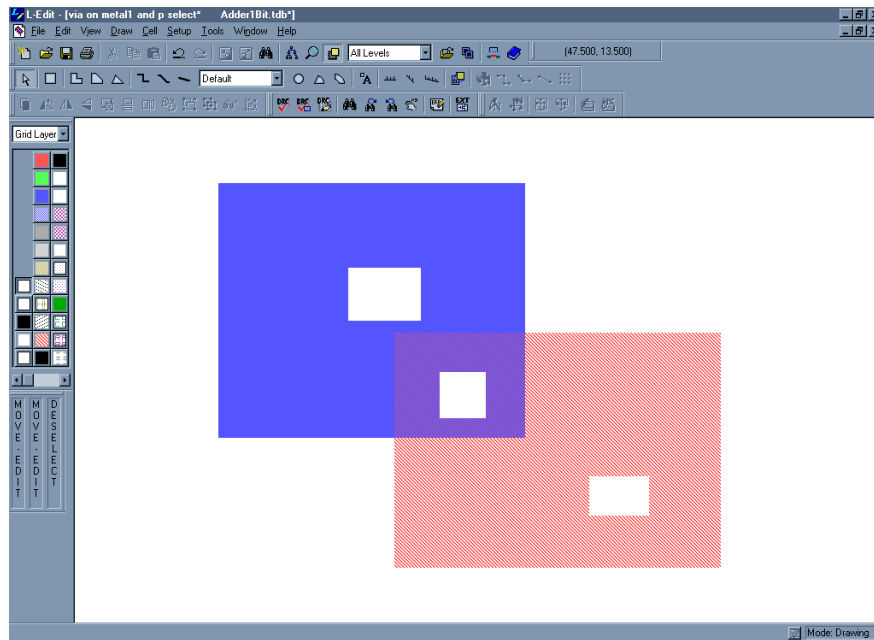
Pass

Each layer is rendered in one pass. The order in which layers are rendered is determined first by position in the layer list and then by the **pass** value. Lower pass values are rendered first, with possible values ranging from one to ten.

You can set your rendering passes so that objects will be drawn in a way that parallels the manufacturing processes or simply to control rendering of overlaps. However, a layer that is derived from other layers must be below all its source layers in the layer list.

For layers with both fill and an outline, fill is rendered first, then the outline, and both will be completed before the fill for the next layer is started. Selection is always rendered with the last pass (10).

Note that for rendering, pass order will take precedence over layer order in the **Layers** list.

Pattern

To change the stipple pattern, select one of the predefined patterns from the drop-down list. **None** fills in none of the pixel elements used to create a pattern—a **None** pattern for fill yields no fill, a **None** pattern for outline yields no outline. A **Solid** fills in all pixel elements.

You can also pick **Other** to open the **Create Pattern** dialog,where you can design a new pattern.
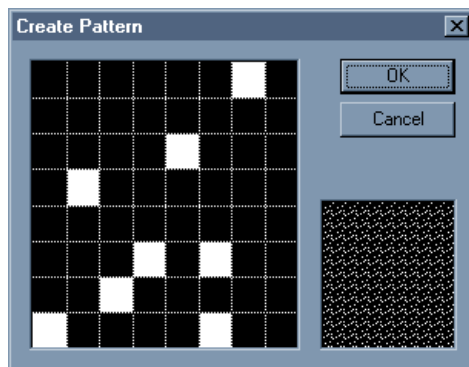
New patterns are added to the bottom of the drop-down list with the label "custom."

Color

To set rendering color, click one of the bars or bit codes in the drop-down list.

The number of colors available and how they are sorted is controlled in the **Setup Palette** dialog. (See Color Parameters on page 1-107 for more information.)
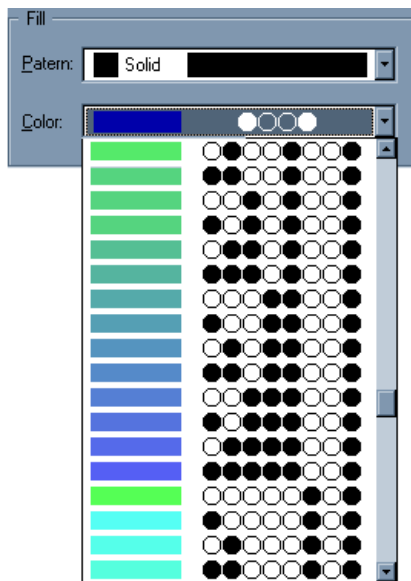
To outline an object when it is selected, click on the "Selected..." element name in the list, define an outline style, and set the fill pattern to **None**.

Outline Style

You can set both a line style and width for outlines. Line width can be measured in either pixels or locator units.
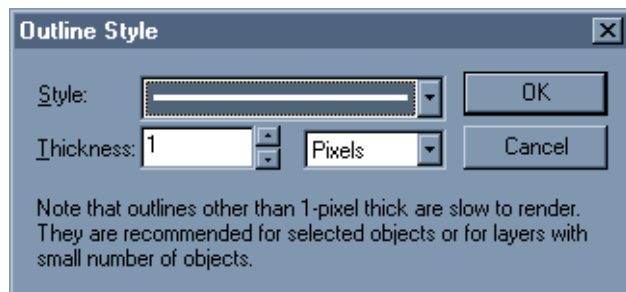

For curved geometry, outline thickness is displayed at a fixed value of **1 pixel**.

Note that boxes and rectangular polygons are rendered so that all edges include the snap grid pixels. When two such drawn objects coincide, they will therefore overlap by a width of one pixel. Such an overlap will be rendered in a distinct color, creating a visible line, unless you use a leyer setup where the outline is the same color as the fill.

Wire Styles

An L-Edit wire consists of one or more rectangular segments joined at common ends. All segments in the wire have the same width, but each segment can have a different length. The point where two segments meet is called a *join*. The *endpoints* of a wire are the two segment ends which are not involved in joins.
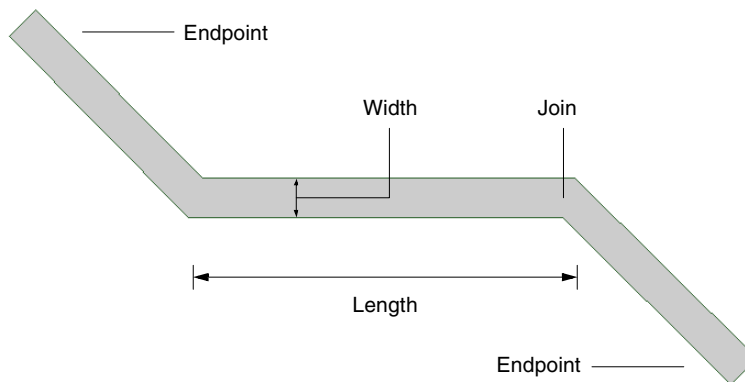

A wire is characterized by a *style*, consisting of three properties:

- *Width* (in locator units—*different* from the "width" reported in the status bar when a wire is selected).

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- *End style* (the appearance of the wire's endpoints).

- *Join style* (the appearance of the wire's joins).

When you select a wire, the width value reported in the status bar is the *x*-width of the minimum bounding box of the whole wire, as shown here:

Minimum bounding box

Width reported in status bar
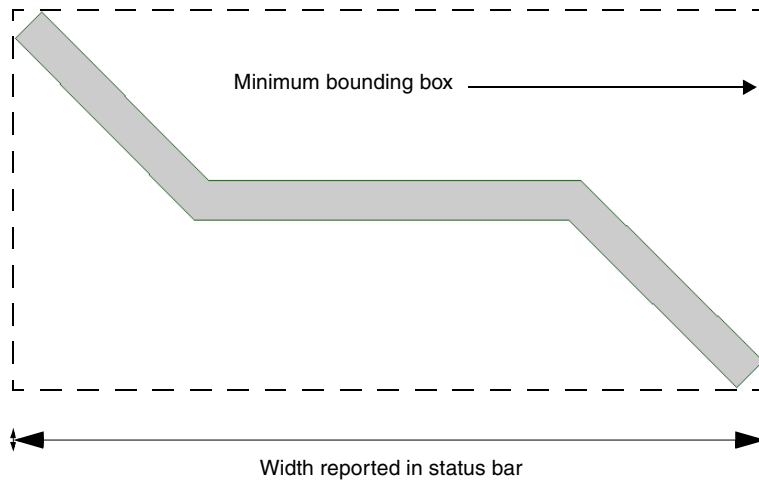
End Styles and Join Styles

L-Edit recognizes three end styles and four join styles. These styles affect the appearance of wires on the screen only, and changing a wire's style does not affect its endpoint or vertex coordinates. Contact your fabricator to determine the actual method of fabricating wires and what end and join styles the fabricator supports.

Warning: It is critical to verify that your fabricator interprets wires in the same manner as your layout. Otherwise the actual chip fabricated may be very different from what you wanted.

End styles include:

End styles	*Description*
Butt	Flush with the endpoint.
Round	"Capped" with a half-circle whose diameter equals the wire width.
Extend	Extended past the endpoint for a distance equal to half the wire width.

Join styles include:

Join styles	*Description*
Layout	The adjoining segment ends are extended to a distance equal to half the wire width. The resulting gap is filled with a triangle. This is the default join style.
	This join style corresponds most closely to the interpretation of wires used by most fabricators. We recommend using this join style exclusively in your designs. (Wires created in versions of L-Edit previous to version 5 are automatically converted to the join layout style.)
Round	The adjoining segment ends take on the round style.
Bevel	The adjoining segment ends take on the butt style. The resulting gap is filled with a triangle.
Miter	The adjoining segment ends are extended until their outer edges meet. If the angle between the two segments is less than the user-specified *miter angle*, a bevel join is used instead.

The figure below illustrates various end and join styles.
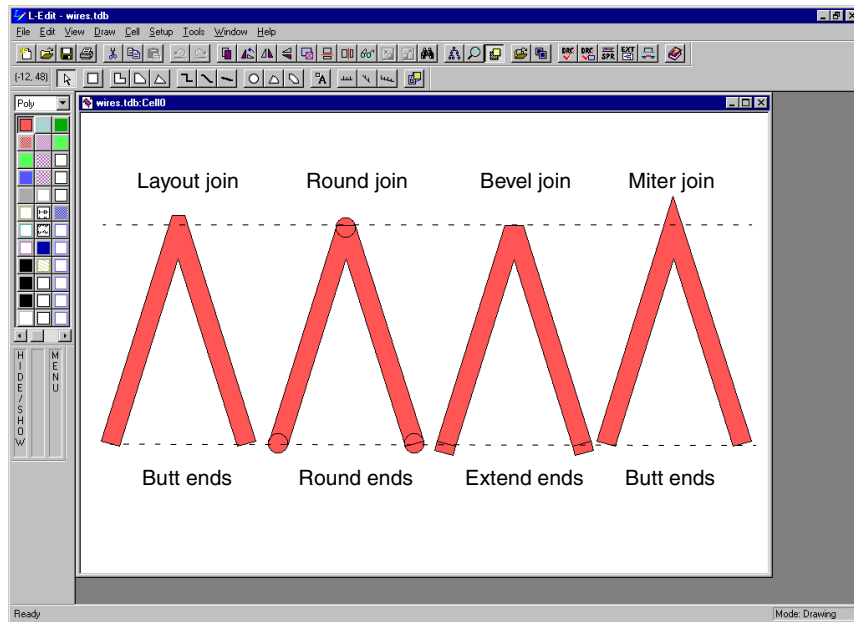
Wire Style Defaults

When a wire is first created, its style is taken from the default setting for the layer on which the wire is drawn, specified by choosing **Setup > Layers**. You may change the wire style parameters in the **Default wire setting** area in the **Setup Layers** dialog.

Before you draw wires for the first time, or if you are setting up technology files for others who may use wires, set the wire defaults for each layer according to whether your likely output format will be CIF or GDS II.

For CIF, use wires with the *extend* end style and the *layout* join style.

For GDSII, allowable combinations of end and join styles are shown in the table below. All other combinations of end and join styles will produce an error message when exporting to a GDSII file.

End style	*Join style*
Butt	Layout
Round	Round
Extend	Layout

After you draw an individual wire you can change its individual style with **Edit > Edit Objects**.

Special Layers

Special layers are used to represent L-Edit constructs such as the display grid, origin, drag boxes, and so on. They are treated just like other layers—you can define them using **Setup > Layers**, draw objects on them, and specify design rules for them. In fact, they may be identical to layers used for other purposes (for example, Poly can be designated as the Grid layer). Choose **Setup > Special Layers** to designate special layers. Select an appropriate layer from the drop-down menu next to each field.

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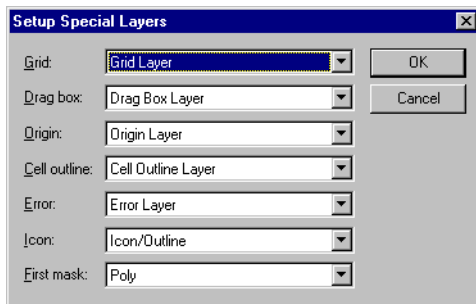
Options include:

Grid	The layer on which the displayed grid points are drawn.
Drag box	The layer on which the boxes displayed during a drag operation are drawn and on which the nibbling wire is drawn.
Origin	The layer on which the crosshair marker representing the coordinate system origin is drawn.
Cell outline	The layer on which instanced cell outlines are drawn.
Error	The layer on which DRC and SPR error markers are drawn.
Icon	The layer on which non-fabricating comment items are drawn.
First mask	The layer on which the first fabrication mask is drawn.