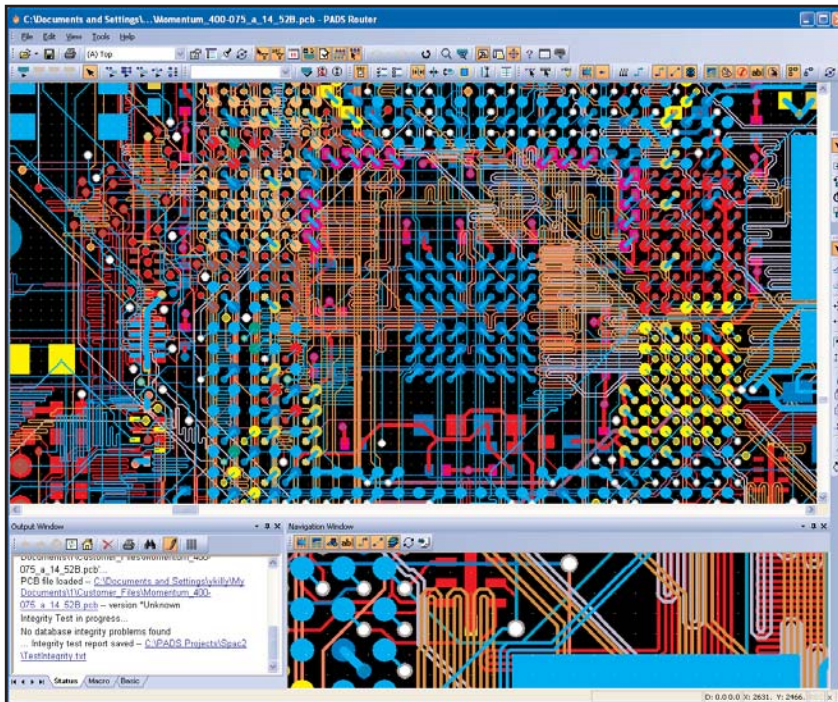


# PADS Routing Solutions



Whether you prefer to route interactively, automatically, or with a combination of both, PADS® Routing Solutions can get the job done right, quickly and accurately.

## Overview

PADS® Routing Solutions feature efficient methodologies and native, any-angle and diagonal routing algorithms that make it easy to produce high-density, high-quality designs efficiently. Choose the tool(s) that meet your needs:

- PADS AutoRouter - High-performance, any-angle autorouter
- PADS AutoRouter HSD - Tools for batch and interactive high-speed routing
- PADS Router - Shaped-based, gridless interactive route editor
- PADS Router HSD - Tools for interactive high-speed routing

PADS AutoRouter is the industry's first true, angle-free autorouter. It is tightly integrated with PADSLayout, for fast, efficient layout and routing. By routing correctly from the outset, PADS AutoRouter minimizes trace rework, thus reducing design iterations and getting your board to fabrication faster.

PADS AutoRouter now works with PADS Router, our interactive route editor. Two new options, PADS Router HSD and PADS AutoRouter HSD, offer interactive and automatic routing of length-constrained nets for efficient High Speed Design.

The ultra-fast, animation-quality graphics of PADS Routing Solutions enable you to review board designs quickly and easily, while hierarchical project windows make it easy to see the relationship between design elements.

## Major product features

The industry's newest routing technologies

- Advanced algorithms for high-density and high-speed routing
- Pre-route analyses
- Critical DRCs
- Multiple interactive DRC modes
- Superior interactive routing control
- Superior hierarchical rules structure
- Advanced manufacturing route strategies
- Multiple topologies
- Customizable GUI

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## Core Functionality

All PADS Routing Solutions offer the following capabilities:

**Rule-based Routing** – PADS AutoRouter automatically follows geometric design rules entered at the schematic or PCB level, so you don't have to create design rules or complex control files prior to routing. Advanced algorithms optimize design completion and routing performance without intervention, minimizing post-route rework.

**Intelligent Route Control** – PADS AutoRouter uses “push and shove” and “rip-up and retry” technologies for batch-routing results that rival interactive routing in design quality and aesthetics. Busses and sequential signals flow smoothly between components with optimal pad entries and minimal vias. Trace angles are maintained during trace modification. A unique post-route “Tune” pass adjusts length-constrained traces to improve manufacturability.

**Design for Fabrication** – PADS AutoRouter combines pad-entry controls, same-net clearance rules, copper sharing, and component-fanout operations to prevent traces from wrapping around a pad or entering a pad at an acute angle. The “Center” pass increases manufacturing yields by automatically equalizing the space between components and adjacent vias pads and traces.

PADS AutoRouter also decreases manufacturing costs by reducing the need for microvia technology and additional layers.

**Design for Testability** – Traditionally, design testpoints are added after routing. This adds a step to the design process, hinders productivity, and can compromise design integrity. PADS AutoRouter inserts ATE testpoints automatically during routing for superior results over post-route testpoint insertion methods.

Integrated DFT routing reduces time spent in post-route and manual testpoint placement. PADS AutoRouter provides both integrated testpoint routing and post-route auditing capabilities, enabling you to adapt PADS AutoRouter to your existing test process.

**Any-angle Routing** – Angle-free pad entry and routing minimize post-route clean-up efforts and reduce routing time of high pin-count packages. They also ensure high-quality completion of designs that use pads rotated at odd angles. True diagonal routing minimizes trace lengths and the number of layers needed to complete higher-density boards.

**Component Entry Rules** – For better routability of high pin-count, fine-pitched devices, PADS AutoRouter automatically adheres to component entry rules, such as unique trace width and clearance rules.

Component entry rules can be set to decals or individual components. This is helpful when you need to route out from fine-pitched devices. By setting the trace width and/or clearance smaller than the desired or recommended rules, you can enable PADS AutoRouter to create a narrower trace segment than would otherwise be allowed. Once the trace clears the component boundary, it reverts to the recommended width and clearance. PADS AutoRouter has been shown to provide higher completion rates on dense designs than competing autorouters.

**Vias at SMD** – To meet the challenges of today's very dense designs, many customers allow vias to be placed inside the pads of surface mount devices (SMDs). Most fabricators have rules for the positioning of these vias within the SMD pads. PADS AutoRouter provides easy-to-use controls that let you route dense designs according to the manufacturer's fabrication rules for vias at SMD. Vias under SMDs include Center, End, Fit, and more.

**Pre-route Analysis** – Trying to route designs that have set-up errors or unroutable constraints is frustrating and wastes time. With PADS AutoRouter, you can avoid these problems by running pre-route analyses of your designs. With a single utility you can check more than 30 settings that affect board routability, including grid settings, plane nets, pad-entry settings, thermal status, disabled layers, and max lengths.

**Post-route Design Verification** – To confirm that your design rules and constraints have been met, a batch design rule check runs an array of verification utilities. These include: automatic checking of differential pairs, component entry rules, net scheduling, and min/max lengths.

**Advanced Help System** – PADS AutoRouter uses Microsoft® standards to give you the help you want when you need it. Context-sensitive and embedded HTML Help provide operation-specific assistance. All selections are represented as hot links in an Internet Explorer command window, creating interactive reports and messages.

**Customizable User Interface** – PADS AutoRouter lets you customize menu items, toolbars, and hotkeys so that you can work the way you want to. For on-the-fly customization, just drag and drop new icons onto new or existing toolbars. You can also dock, undock, or resize all system windows and toolbars based on your preference. The customizable user interface also supports savable workspaces, allowing you to store and recall screen layout preferences for situations where multiple designers share the same computer. PADS AutoRouter also provides an editing environment that allows you to create custom macro applications using Visual Basic (VB) or C++.

## Interactive Routing

PADS Router is the PADS, interactive route editor. Based on shaped-based algorithms, PADS Router is superior to the Dynamic Route Editor (DRE) found in earlier versions of PowerPCB™.

PADS Router is built on proven, shaped-based technology, so you can enable and disable features as you route such as trace and via plowing, smoothing, pad entry, trace-length maintenance, and automatic route completion. Yet we haven't removed the PADS Layout keyboard combinations you're used to, so traces can still be edited with familiar keyboard commands.

**Multiple Plow Modes** – Maximum interactive routing flexibility includes plow by mouse (as the cursor moves), by click (postpone plowing until you click), or by rip-up (unrouting crossed traces). Plowing can push traces ahead or behind the trace being routed.

**Design Rule Checks** – DRCs can be set to a variety of modes, including Prevent, Explain, Warn, and Off. A filter can be enabled or disabled to detect violations by type (e.g., clearance, width, same net, placement, or length).

**Real-time Feedback** – PADS Router also provides a variety of real-time graphical aids during routing. A trace-length monitor displays the routed trace length, the estimated length to completion, and a progress indicator that shows whether a trace is violating or within its length constraints. “Guard Bands” show DRC boundaries. Unlike other tools, PADS Router displays guard bands around each individual obstacle, rather than showing a band around the entire trace. This maximizes routing density as the keep-away boundary can vary with each obstacle.

**Dynamic Routing** – With PADS Router you can dynamically add and move vias and testpoints. You can also add and stretch segments while maintaining adjacent angles. If you add and move corners or T-junctions, adjacent segments are stretched automatically while net rules are maintained. When faced with an immovable obstacle, you can elect to bend traces dynamically or simply hop over the obstacle. With PADS Router you can also create and modify arcs. You can convert a line segment or a corner to an arc'd segment, convert a corner to an arc'd (mitered) corner, or convert a segment to an arc and stretch it.

Other features include the

ability to see your unroutes and a new “Quick Route” utility that automatically generates a new path simply by following your bend points and pushing existing traces away.

**Net Rescheduling** – PADS Router also lets you reorder (reschedule) nets without performing an ECO operation. You can reschedule single pin pairs and get immediate feedback at your cursor as to the validity of the connection.

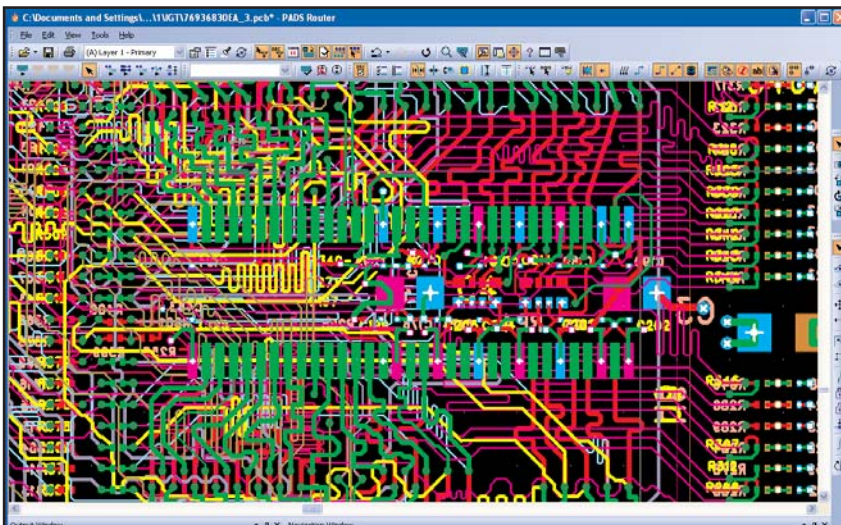
## High-speed Routing

Two options for routing high-speed designs: PADS AutoRouter HSD and PADS Router HSD.

PADS AutoRouter HSD is a superset of automatic and interactive high-speed routing capabilities. PADS Router HSD is a subset of tools specialized for interactive high-speed routing. Both enable you to route length-constrained nets anywhere in the rules hierarchy. For example, net rules can be assigned at the default, net, or class level, and pin-pair rules can be assigned at the group and pin-pair level. Matched-length rules can be set at the net, class, group, or pin-pair level.

Both PADS AutoRouter HSD and PADS Router HSD also give you the option to route with diagonal (135°), rather than 90° trace corners, whenever possible. This eliminates undesirable impedance changes caused by sharp corners and helps ensure the correct routing of length-constrained nets. With PADS Router HSD, all the interactive routing functionality described on this page also applies to high-speed routing.

Note: Both PADS AutoRouter HSD and PADS Router HSD require the Advance Rule Set (ARS) option.

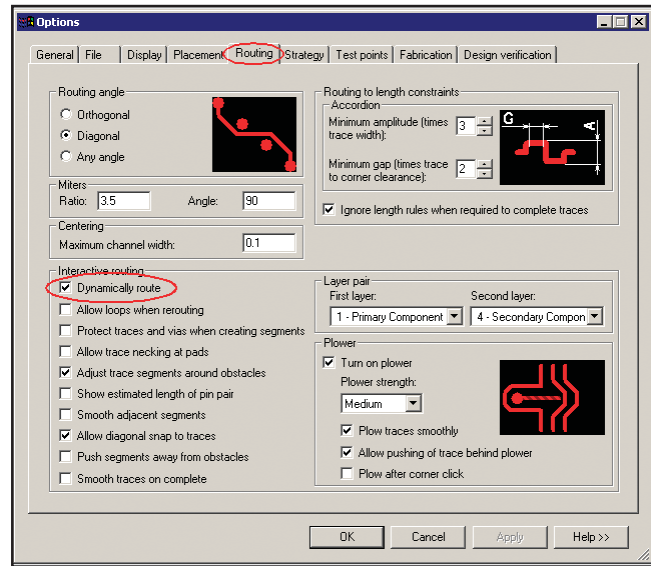


The plowing action of PADS Router pushes traces out of the way as you route.

**Differential Pairs** – Differential pairs are critical to high-speed design, as they allow you to control signal skew, timing windows, and susceptibility to interference. PADS AutoRouter HSD maximizes these noise-canceling effects automatically. If you prefer interactive control over these effects, use PADS Router HSD. It gives you a choice of how you route differential pairs: together, by selecting a single pin-pair member, or separately.

Both PADS AutoRouter HSD and PADS Router HSD keep the differential pair signals together for as much of the routing path as possible. Both also respect the differential-pair settings made in PADS Layout with regard to class-to-class clearances. These settings include your pair-to-pair and pair-to-other preferences. You can even assign different design rules for differential pair gap and width according to layer.

Although it is preferable to route differential pairs without using vias, occasionally they are necessary, so both PADS AutoRouter HSD and PADS Router HSD offer five via-insertion patterns to choose from. As the via-pair steps through the available patterns, the system recomputes and displays the smoothest paths for the connected traces. This allows accurate prediction of the finished routing paths before you continue routing.



*Dynamic routing of high-speed nets.*

## Summary

PADS AutoRouter and the entire line of PADS Routing Solutions provide an efficient and productive means of automatically and/or interactively routing complex and high-speed printed circuit boards with ease and high quality.

Easy-to-use features, combined with advanced angle-free, high-speed DFF, and DFT capabilities get your designs to fabrication more quickly and with higher quality than ever before.

Visit our website at [www.mentor.com/pads](http://www.mentor.com/pads)

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