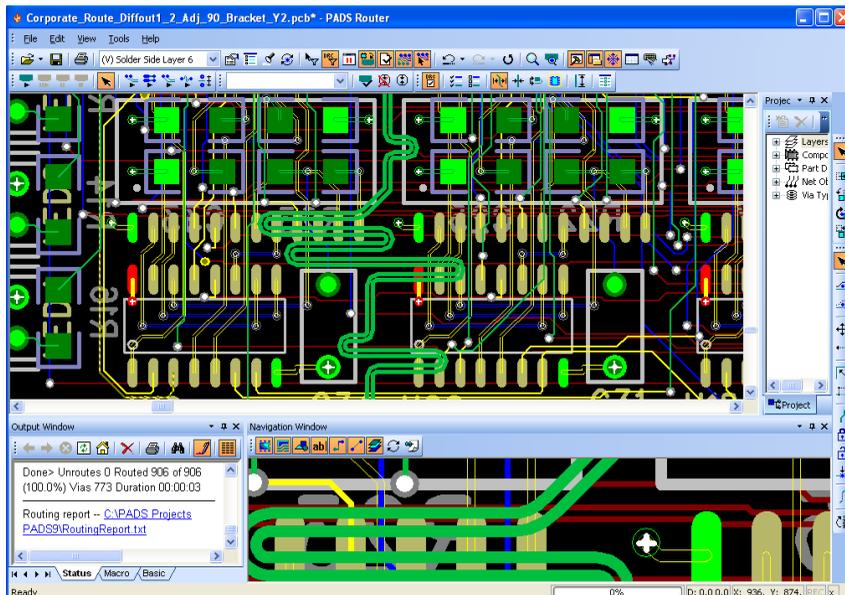


# PADS Routing Solutions



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. Designers can choose from several PADS Routing Solutions:

- 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 auto-router. It is tightly integrated with PADS Layout for fast, efficient layout and routing. By routing correctly from the outset, PADS AutoRouter minimizes trace rework, reducing design iterations and getting newly-designed boards to fabrication faster.

PADS AutoRouter now works with the PADS Router 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 fast and easy review of board designs, while hierarchical project windows make it easy to see the relationships among 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. There is no need 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. Buses 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 on post-route and manual testpoint placement. PADS AutoRouter provides both integrated testpoint routing and post-route auditing capabilities, enabling PADS AutoRouter to be adapted to an existing test process.

**Any-Angle Routing** – Angle-free pad entry and routing minimize post-route clean-up work and reduce routing time for high-pin-count packages. Any-angle routing also ensures high-quality completion of designs that use pads rotated at odd angles. True diagonal routing minimizes both 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 those specifying unique trace width and clearance attributes.

Component entry rules can be set to decals or individual components. This is helpful when it is necessary to route out from fine-pitched devices. With the trace width and/or clearance set smaller than the desired or recommended rules, PADS AutoRouter can 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 positioning vias within the SMD pads. PADS AutoRouter provides easy-to-use controls that permit the routing of dense designs according to the manufacturer’s fabrication rules for vias at surface mount devices. Via conditions 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. To avoid these issues PADS AutoRouter can run pre-route analyses of new designs. A single utility is all it takes to 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 design rules and constraints have been met, a batch design rule check can run 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 provide the help when needed. Context-sensitive and embedded HTML Help provide operation-specific assistance. All selections appear as hot links in an Internet Explorer command window that creates interactive reports and delivers messages.

**Customizable User Interface** – PADS AutoRouter permits customization of menu items, toolbars, and hotkeys so that users can work the way they want to. On-the-fly customization is a simple matter of dragging and dropping new icons onto new or existing toolbars. All system windows and toolbars can be docked, undocked, or resized to suit the user’s preferences. The customizable user interface also supports

savable workspaces, allowing easy storage and recall of screen layout preferences when multiple designers share the same computer. PADS AutoRouter also provides an editing environment for creating custom macro applications using Visual Basic (VB) or C++.

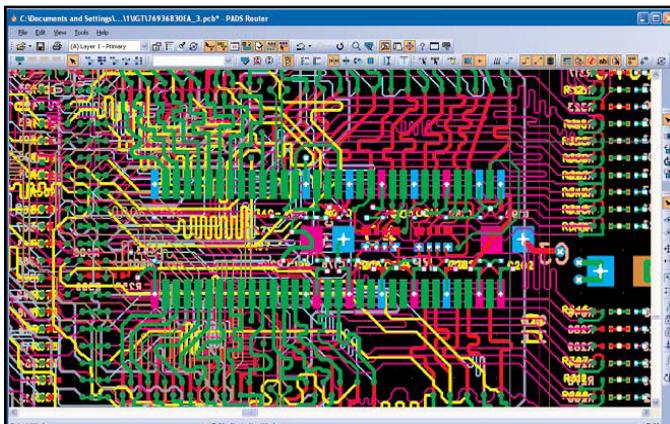
**Interactive Routing** – PADS Router is the PADS interactive route editor. Based on shaped-based algorithms, the PADS Router is superior to the Dynamic Route Editor (DRE) found in earlier versions of PowerPCB™

PADS Router allows users to enable and disable features while routing. This capability pertains to features including trace and via plowing, smoothing, pad entry, trace-length maintenance, and automatic route completion.

**Multiple Plow Modes** – Maximum interactive routing flexibility includes plow by mouse (as the cursor moves), by click (postpone plowing until a click occurs), 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 to detect violations by type (e.g., clearance, width, same net, placement, or length), or disabled.

**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.



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

**Dynamic Routing** – PADS Router makes it possible to dynamically add and move vias and testpoints, and even to add and stretch segments while maintaining adjacent angles. If corners or T-junctions are added or moved, adjacent segments stretch automatically while adhering to net rules. When faced with an immovable obstacle, designers can elect to bend traces dynamically or simply hop over the obstacle. PADS Router also offers a means to create and modify arcs. Line segments can be converted into segments with an arc, with or without stretching. Similarly, corners can be transformed into mitered corners or arc segments.

Other features include viewable un-routes and a new “Quick Route” utility that automatically generates a new path simply by following bend points and pushing existing traces away.

**Net Rescheduling** – PADS Router also supports reordering (rescheduling) of nets without an ECO operation. Designers can reschedule single pin-pairs and get immediate feedback at your cursor as to the validity of the connection.

**High-speed Routing** – There are 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 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 offer the option to route with diagonal (135°), rather than 90° trace corners when possible. This eliminates undesirable impedance changes caused by sharp corners and helps to ensure the correct routing of length-constrained nets. With PADS Router HSD, all the interactive routing functionality described here also applies to high-speed routing.

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

**Differential Pairs** – Differential pairs are critical to high-speed design, and PADS AutoRouter HSD provides a way to control signal skew, timing windows, and susceptibility to interference in differential circuits. It maximizes noise-canceling effects automatically. Alternatively, PADS Router HSD provides interactive control over these same effects, offering designers choices in routing differential pairs: together, by selecting a single pin-pair member, or separately.

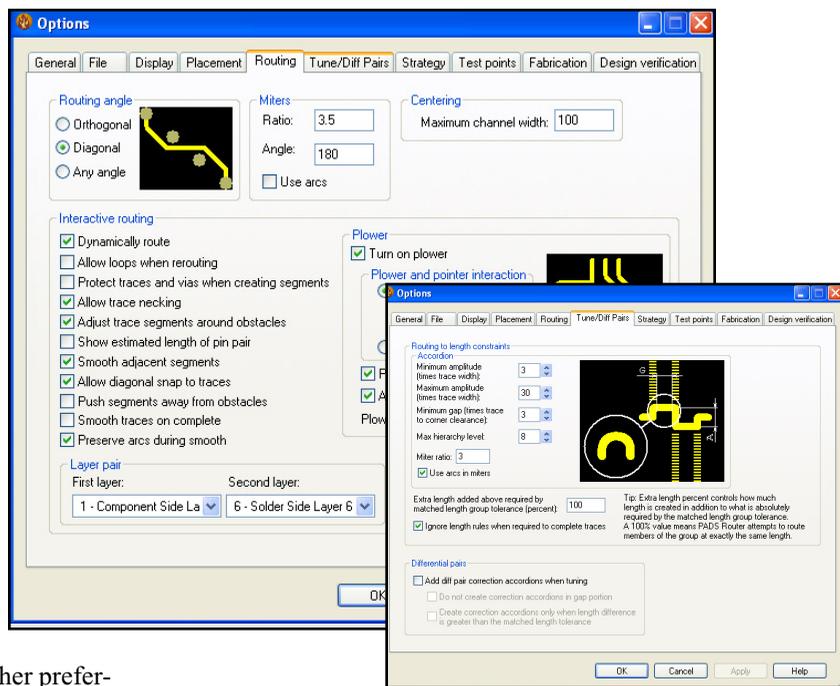
Both PADS AutoRouter HSD and PADS Router HSD keep the differential pair signals together for as much of the routing path as possible. Both also respect the differential-pair settings made in PADS Layout with regard to class-to-class clearances. These settings include both pair-to-pair and pair-to-other preferences.

Although it is preferable to route differential pairs without using vias, such vias are sometimes unavoidable. 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 re-computes and displays the smoothest paths for the connected traces. This allows accurate prediction of the finished routing paths before routing proceeds.

## 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 new designs to fabrication more quickly and with higher quality than ever before.



*Interactive and Batch routing controls of high-speed nets*

## Platform and Operating Systems

### Operating Systems

- Windows XP (service pack 2)
- Vista on Intel-based systems

### Memory Requirements

- Windows Vista Ultimate or Business Editions
- 2 GB or more
- Windows XP Professional (SP2): 1 GB or more

### PC Hardware

- Pentium IV 2+ GHz recommended
- High-speed CPU recommended
- Three-button mouse or mouse with scroll wheel recommended
- Minimum display 1024 x 768 with 256 colors

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