

# electronic design

---



William Wong /// EMBEDDED/SYSTEMS/SOFTWARE EDITOR

# BUILD YOUR OWN PC BOARD: A DESIGNER'S DREAM

**LPKF's ProtoMat S62 desktop milling machine exceeds designers' expectations with its mini learning curve coupled with low cost and fast turnaround.**

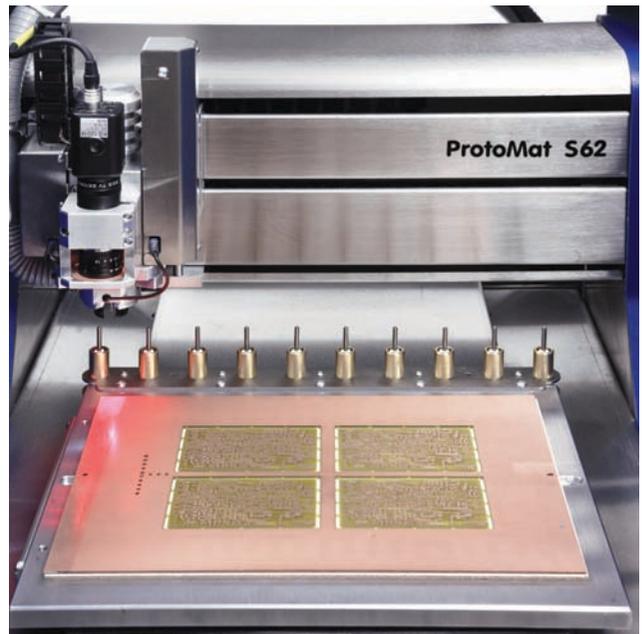
**best**  
electronic  
design

**Electronic Design engineers cast their votes on the most popular Leapfrog article of this year and... insert drum roll here... the winner is LPKF Laser and Electronics' low-cost, S62 circuit-board plotter (Fig. 1).** Not only is the article

popular ("Build A Board In-House Without The Mess," March 31, p. 39, ED Online 9984), but the LPKF Laser and Electronics' webcast covering the S62 was and remains a very popular session.

The desktop S62 is a 3D milling machine designed to create pc boards. Its 10-tool autochanger enables it to handle a wide range of jobs (Fig. 2). The plotter's milling head travels at 150 mm/s, and the high-performance spindle motor ratchets up to 62,000 rpm. Also, its Z-axis movement permits depth in RF designs as well as very flexible modifications to non-pc-board materials (such as covers, photomasks, and labels).

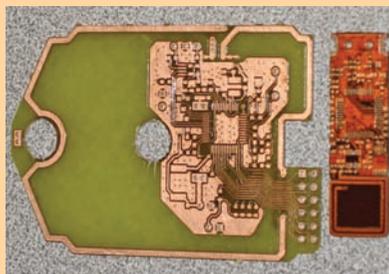
According to LPKF's North American sales manager Jim Greene, the S62s are rolling off the assembly line to customers as fast as the company can make them.



**1. The ProtoMat S62's high-speed platter can create pc boards in addition to milling a range of other materials for creating front panels, housings, and other components.**

## TWO TO THREE CUSTOM JOBS A DAY!

Jaalaa is a fabless semiconductor company that delivers complete wireless solutions using chips like its KillerBee-HID (Human Interface Device) and KillerBee-XR (eXtended Range) series. Imraan Ahmed, vice president of operations, chose LPKF's solution to help Jaalaa turn out two to three custom boards per day. A board fits into Jaalaa's customers' supplied packaging, where it is immediately tested and verified.



This board has been designed for a wireless mouse set.

Jaalaa's customers then can use the design for mass production.

In-house board creation enables Jaalaa to provide minimum turnaround time in addition to keeping costs down. This allows the company's customers to get their product out the door quickly with the latest technology. It's the trend of the future.

**Jaalaa Inc. • [www.jaalaa.com](http://www.jaalaa.com)  
ED Online 11534**

Thanks to their \$18,900 price tag, units can find homes in organizations that couldn't afford this type of technology in the past.

**WHY IS IT SO POPULAR?** • Many users cite the unit's fast turnaround as its key advantage (see "Two To Three Custom Jobs A Day," below, "Prototyping At The University Of New Brunswick," p. 90, and "Building PC Boards In British Columbia," p. 92). This feature had a major impact on numerous design aspects because it's now possible to crank out a new design as it's developed. The S62 also makes incremental changes, fixes, or enhancements practical. Test,

debug, refine can now be the mantra for both board development and software.

The ability to quickly create a single board means that developers can verify their design before making additional boards. This avoids wasted boards when a major design defect is found. Even minor fixes can be easily accommodated.

When it comes to media, many designers are starting to appreciate flexibility. The S62 can cut



**2. The ProtoMat S62's 10-bit auto changer permits continuous, automatic operation with a host of tools.**

photomasks, pockets in microwave boards, covers for boxes (including holes for sockets), and much more.

Most S62 users are experimenting with these features, which can enable them to create customized boards and boxes for individual projects. This is in contrast to pc-board houses, which are set up to make dozens of identical boards per run. These houses still play a part for many S62 users because they do excel in volume production compared to the S62. You won't make thousands of identical boards with the S62, but a dozen or more is well within the in-house break-even point.

## PROTOTYPING AT THE UNIVERSITY OF NEW BRUNSWICK

Higher educational research often demands repeated creation of new and improved prototypes. The Institute of Biomedical Engineering at the University of New Brunswick, Fredericton, N.B., Canada, has a long history in the research and clinical aspects of advanced myoelectric controls systems for artificial limbs, and it's recognized worldwide for this work.

"The design and fabrication of prototypes is a key element of much of this research, and it is here that we utilize the Protomat S62," says chief technologist John Hayden. He looked to the S62 because of the increasing demands placed on board production by surface-mount components. He also indicated that some designs were using the minimum isolation width to keep board size to a minimum.

Research that uses RF layout for wireless bio sensors will be one of the projects tackled in the near future.

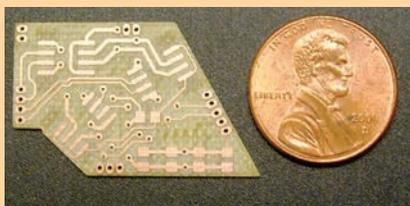
**Institute of Biomedical Engineering, University of New Brunswick**

[www.unb.ca/biomed](http://www.unb.ca/biomed)

**ED Online 11535**



**1. John Hayden, chief technologist with the Institute of Biomedical Engineering, depends on the ProtoMat S62 to create prototype boards that serve as myoelectric control systems for artificial limbs.**



**2. This tiny, odd-sized, double-sided circuit board goes inside a prosthetic electric hand. The board must be small enough to fit within the limited space inside the device. Components and cables are mounted on both sides of the board.**

### PLAYING IT CLOSE TO THE VEST •

In-house pc-board creation isn't new. But it was never cleaner and as inexpensive as with the S62. Moreover, developers can keep control of a design. The CIA and NSA aren't the only organizations that will restrict access to a board.

Proprietary intellectual property (IP) is often the centerpiece of a company's product design, and this is often embodied in the pc board. The S62 simplifies security management, because physical security is typical within this workplace.

The S62 also has other implications when combined with the fiducial recognition camera used for



**3. Members of the S62 Development Team in Garbsen, Germany.**

repeated operations on a pc board or other material. The ability to add more circuitry to an existing board enables delivery of custom boards, depending on the application and buyer. A supply of partially configured boards can be updated easily using the S62. Likewise, a board consumer could use an S62 to add

circuitry to a virgin part of a pc board.

**EASIER THAN IT LOOKS?** • S62 users discover that there's a short learning curve. Not even sophisticated and very compact designs can hold back novices. If the pc-board design software can gener-

ate it, then the S62 usually is able to comply.

Developers can push the size limits of their design because there's little cost to trying out a design. A newer, more compact design only requires a pc-board design change and a new board from the S62.

Because operating the S62 requires minimal training, virtually anyone can handle the job of actually setting up and running the unit. Of course, developers love to get their hands on it because they don't have to wait for someone else to configure the system. Unfortunately, they often must wait in line due to the units' popularity among other groups within their own organization. Luckily, it's easy to hide the S62. It's self-contained, small, and quiet. Just attach a PC via a USB cable to drive it.

Milling pc boards isn't new. Units that are larger and more expensive than the S62 have been available for years, many from LPKF. But the price, size, and ease of use cause S62 users to make a quantum leap to change how they design and what designs they can consider.

The ProtoMat S62 has proven to be extremely popular. However, you can be on the lookout for another soon-to-arrive unit from LPKF Laser and Electronics—the less expensive S42 forgoes the tool auto-changer, which isn't always required. ☺

**LPKF Laser and Electronics**  
www.lpkfusa.com **ED Online 11537**

## BUILDING PC BOARDS IN BRITISH COLUMBIA

**Gregory Industrial Computer Ltd. (GIC) develops computer systems and command centers for the forest and lumber industries in the central and northern regions of British Columbia.**

**"Ultimately, the automated tool changing was what made it [S62] more attractive than other options, but the multilayer board potential as well as operational flexibility were also factors and, of course, price," says GIC manager Greg Ford. "I can say that the learning curve was a lot easier than I had feared."**

**GIC engineer Chris Nicol takes great joy in seeing how much more tightly packed he can make each revision or new board he designs. "I have not been disappointed yet," he says.**

**One of GIC's most recent pc boards utilizes a Freescale 9S12 microcontroller in addition to a number of surface-mount components. Even viewed under a microscope, the circuits and pads that are generated by the ProtoMat S62 are sharp and crisp.**

**ED Online 11536**

Copyright © 2005 by Penton Media, Inc.

Germany (Headquarters)  
LPKF Laser & Electronics AG  
Osteriede 7  
30827 Garbsen  
GERMANY  
Phone +49-5131-7095-0  
Fax +49-5131-7095-90  
E-mail lpkf@lpkf.de  
Web info www.lpkf.com

UK/Ireland  
LPKF Laser & Electronics Ltd  
Coppid Beech Lane, Wokingham  
Berkshire, RG40 1PD  
GREAT BRITAIN  
Phone +44-1344-45046  
Fax +44-1344-860547  
E-mail sales@lpkf.co.uk  
Web info www.lpkf.co.uk

North America  
LPKF Laser & Electronics  
28220 SW Boberg Rd  
PO Box 3858  
Wilsonville, OR 97070 USA  
Phone +1-503-454-4200  
Fax +1-503-682-7151  
E-mail info@lpkfusa.com  
Web info www.lpkfusa.com

Japan  
LPKF Japan C., Ltd  
Zip 151-0053  
5-37-6 Yoyogi, Shibuya-ku  
Tokyo JAPAN  
Phone +81-3-34657105  
Fax +81-3-34676159  
E-mail info@lpkf.co.jp  
Web info www.lpkf.co.jp