# Link

Lava I/O News

LAVA

Lava *Made to Order*

Lava has more facets than most people realize. As an experienced and established designer and builder of computer input-output products, Lava makes boards for all sorts of needs. This month's issue of Link looks at some Lava products you won't find on Lava's web site or in the catalog of a distributor who carries Lava boards.

People familiar with Lava usually know us for our retail products: popular boards such as the Parallel-PCI, DSerial-PCI, and USB and FireWire® host adapters are often featured on retailers' shelves and in end users' systems. A second, more specialized, segment of Lava's product line may never show up in a store, but nonetheless appears in Lava's catalogs and on our web site. These are the Lava products that fit the needs of more specialized users. For example, multi-port serial boards like the Octopus-550 and Quattro-PCI usually find their way directly into systems built for Point-of-Sale customers, and the boards themselves never see a retail shelf.

The *really* hidden Lava is responsible for yet a third group of our products: customized designs and products purpose-built for individual customers. When customers need products that are not available off the shelf, Lava is perfectly ready to fill the bill. These products include customized built-to-order boards designed from scratch for medical, manufacturing, POS, industrial, and other mission-critical environments. We know how to come out with the products needed for "heavy lifting." We can tweak an existing design or create a new board from the ground up. Whether a customer needs parallel, RS-232, RS-422, RS-485, USB, IEEE 1394 or Ethernet, Lava can handle the challenge. Lava is the ideal partner for this kind of work: our factory has dual high-speed board assembly

Today's Special Custom Boards
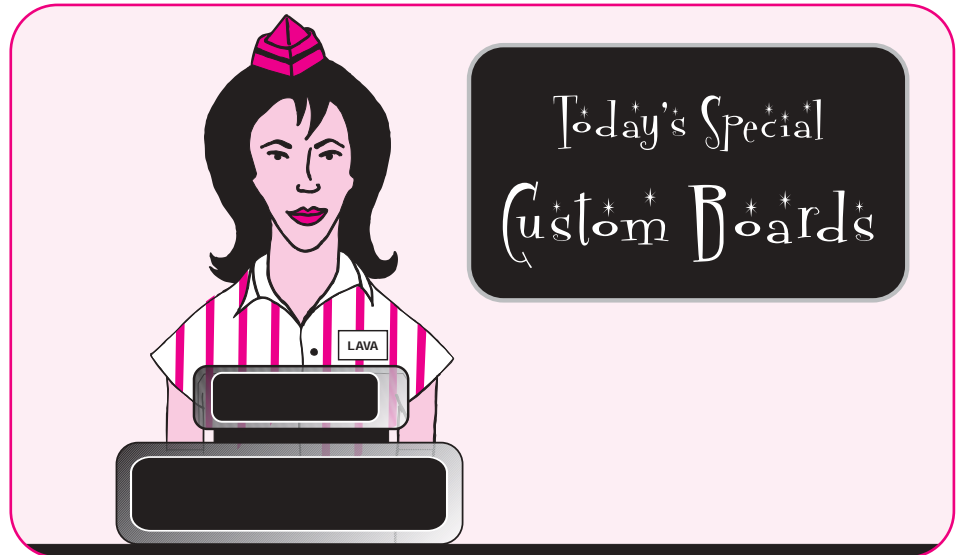
lines, ensuring dependable manufacturing capacity. We are capable of large volume manufacturing, short production runs, and quick turnarounds on work. As well, our engineering, manufacturing, and product testing are all carried out at our Toronto, Canada headquarters. This tight integration makes prototyping and testing boards quick and cost-effective.

Our quality assurance program involves purchasing and designing only high-quality components, using these components to manufacture the best I/O products available, and subjecting every final product to comprehensive individual testing before it leaves the factory. All Lava I/O solutions are covered by the Lava Lifetime Warranty. The company's own rigorous testing procedures and exacting manufacturing standards give its products maximum operating tolerance and reliability.

Every off-the-shelf Lava product is designed to conform stringently to industry standards and protocols, ensuring compatibility and interoperability with other manufacturers' hardware. However, when individual design requirements call for custom interfaces or features,

Lava can design and execute alternatives. Read further to find out about some of the custom work Lava has produced lately.

An All-in-One Ethernet-Serial POS Interface

Here is an example of the type of custom boards Lava can produce. A major retail grocery chain needed a highly specialized serial port server for use with their Point-of-Sale systems. Lava's engineers worked closely with the retailer's systems group to develop this general-purpose Ethernet-to-serial interface board. Its upstream interface is an RJ-45 10Base-T Ethernet connection to a LAN, WAN, or the Internet. The board can be given an IP address and configured as a network device through either a direct serial connection, or through a browser-based web interface that talks to a web server embedded in the board's firmware.

On the downstream side, the board provides eight serial ports for connecting various POS devices. Four of these ports (the ones on the farther side of the board shown) are straight-

forward RS-232 ports. The remaining four ports can be individually set as RS-232, RS-422, or RS-485 ports, as desired. Moreover, each of these four configurable ports has three connectors: two connectors for each port are placed along the near side of the board, and an additional connector is attached by a ribbon cable to a mainboard connector. This design minimizes the need to plug and unplug peripherals when the serial mode of a port is changed.

When deployed in stores, this multi-serial/Ethernet board fits into an enclosure that protects all its components, making it a versatile and robust product. This serial port server board was designed from beginning to end as a targeted solution to this customer's unique needs: it was not available off the shelf from any I/O manufacturer. As a result, the retailer looked to Lava as the true source for ports.

Eight-Port Ethernet-to-Serial Device Server
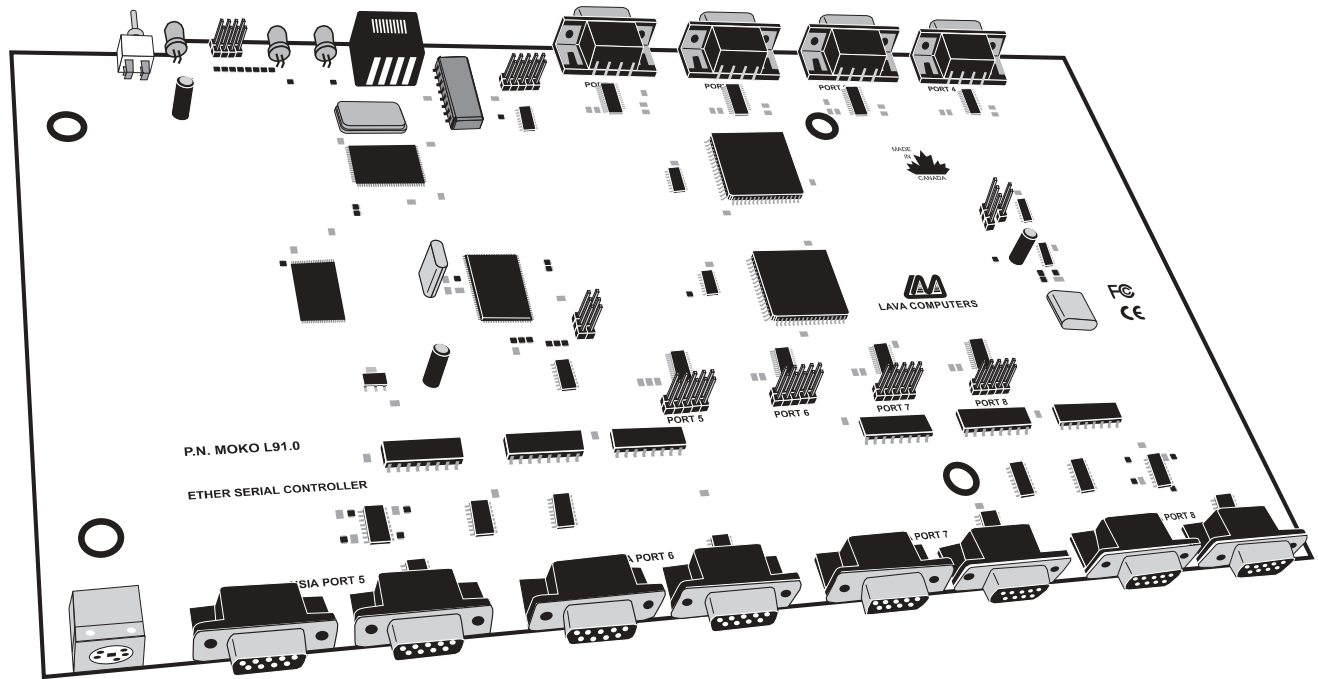
Quick and Easy Ethernet-Serial

This compact internal board is another variation on the theme of the network-addressable serial port. In this case, the customer needed a standard 16550 UART RS-232 port with an Ethernet inter-face. This requirement could have been met by a number of serial port servers on the market, except that the customer's specification had a specialized form factor. The device needed to fit internally into a larger piece of network equipment. In addition, although the board's Ethernet interface is a typical RJ-45 connector, its serial port and power connectors were non-standard: they are both run through the ribbon cable that can be seen in the diagram. Lava was able to prototype and develop this product with very tight timelines.
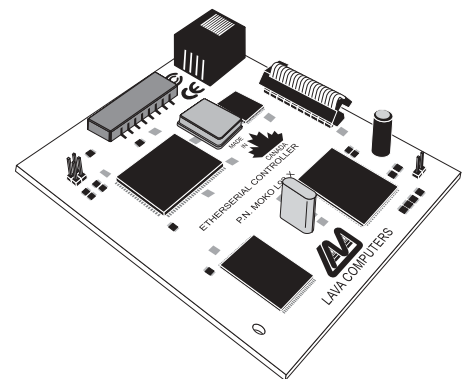
Single-Port Ethernet-to-Serial Device Server

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RS-232, RS-422, and RS-485 Overview

The Eight-Port Ethernet-to-Serial Device Server shown on the left is capable of three serial modes: RS-232, RS-422, and RS-485. Readers of Link's last two issues will by now be well versed in RS-232 serial connectivity, which in any case is the most common of the serial protocols used with PCs. RS-422 and RS-485 may be less familiar. RS-232 references the voltages on its transmit and receive wires to a ground wire — a transmission method called "unbalanced transmission." While simple to implement, this means of serial connection has a few limitations. First, the 50-100 foot maximum cable distances of RS-232 are relatively short compared to the 4000-foot maximums of RS-422 and RS-485. Second, RS-232 is only two-device communication, while RS-422 and RS-485 allow multiple devices. Finally, RS-232 is slower than RS-422 or RS-485.
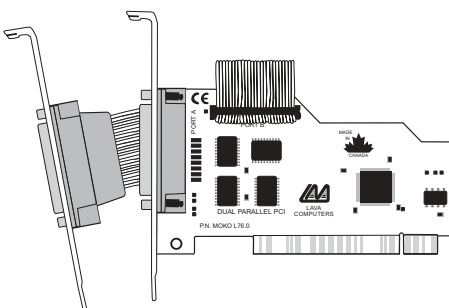
By contrast with RS-232, RS-422 and RS-485 use "balanced transmission" (sometimes called "differential transmission") to represent their signals. Each data signal is sent across a *pair* of wires, with the voltage in one wire the inverted form of the voltage in the other. The receiver compares the *difference* in voltage between the two paired wires to ascertain the signal. The advantage of this system is that electrical noise influencing the cable will generally affect both wires equally (especially when the wires are a twisted pair). As a consequence, the signal will be much less susceptible to electrical noise. A second advantage is that because the signal is represented independently of the ground, differences in ground potential between transmitter and receiver that can occur over long cables will not play havoc with the signal.

In addition, RS-422 and RS-485 can allow multiple devices to communicate. RS-422 can have one master device communicating with up to 10 slave devices; slaves must communicate to other slaves through the master device. RS-485 can allow up to 256 devices to communicate: each can operate as a master or a slave as the need arises.
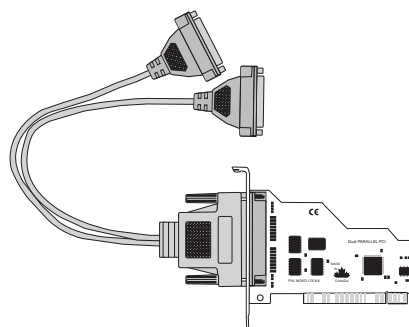
From this, it is clear that a multi-protocol serial POS device like the All-in-One Ethernet-Serial Device Server shown on the left greatly increases the power and flexibility of serial communications for POS systems.

A Dual Parallel-PCI with a Twist

The Lava Dual Parallel-PCI, in its Y-cable form, is a good example of a customized variation on a standard Lava board. A major parcel delivery company needed to add two parallel ports to their order entry and tracking systems, and looked to Lava for the solution. They were impressed with the Lava Dual Parallel-PCI, but the systems they were using had just one available slot opening in the chassis. The standard Lava Dual Parallel-PCI, like two-port parallel boards generally, has its second port on a ribbon cable and occupies two chassis slot openings. Lava designed a Y-cable version of the Dual Parallel-PCI specifically to meet the physical requirements of this customer.

Dual Parallel-PCI

Customized Dual Parallel-PCI

PRODUCT SUMMARY

Serial Boards

PCI	SSerial-PCI	Single 9-pin serial, 16550 UART
	SSerial-PCI/LP	Single 25-pin serial, 16550 UART, low profile
	DSerial-PCI	Dual 9-pin serial, 16550 UARTs
	DSerial-PCI/LP	Dual 9-pin serial, 16550 UARTs, low profile
	Quattro-PCI	Four-port 9-pin serial, 16550 UARTs
	Octopus-550	Eight-port 9-pin serial, 16550 UARTs
	LavaPort-650	Single 9-pin serial, 16650 UART
	LavaPort-PCI	Dual 9-pin serial, 16650 UARTs
	LavaPort-Quad	Four-port 9-pin serial, 16650 UARTs
ISA	SSerial-550	Single 25-pin serial, Com 1-4, 16550 UART, IRQ 3/4/5/7
	DSerial-550	Dual 9-pin serial, Com 1-4, 16550 UARTs, IRQ 2/3/4/5/7/10/11/12/15
	RS422-550	Dual 9-pin serial, 16550 UARTs, RS422 pinout
	LavaPort-ISA	Single 9-pin serial, Com 1-4 16650 UART, IRQ 2/3/4/5/10/11/12/15
	LavaPort-PnP	Single 9-pin serial, 16650 UART, plug and play

Parallel Boards

PCI	Parallel-PCI	Single EPP parallel
	Parallel-PCI/LP	Single EPP parallel, low profile
	Dual Parallel-PCI	Dual EPP parallel
ISA	Parallel Bi-directional	Single bi-directional parallel port, LPT 1/2/3, IRQ 5/7
	Parallel-ECP/EPP	Single ECP/EPP parallel, LPT 1-6, IRQ 2/3/4/5/7/10/11/12

Combo Boards

PCI	SP-PCI	Single 9-pin serial, 16550 UART + single bi-directional parallel
	2SP-PCI	Dual serial (9 & 25-pin), 16550 UARTs + single EPP parallel
	LavaPort-Plus	Dual serial (9 & 25 pin), 16650 UARTs + single EPP parallel
ISA	2SP-550	Dual 9-pin serial, Com 1-4, 16550 UARTs + single bi-dir. parallel, LPT 1-2

USB 2.0 & 1.1 Devices

USB 2.0 Host Adapter	Dual USB 2.0 ports, 480 Mbps, fits in PCI slot
Kazan	Hard drive enclosure with USB 2.0-to-IDE interface
USB 1.1 Host Adapter	Dual USB 1.1 ports, 12 Mbps, fits in PCI slot

IEEE 1394 (FireWire®) Devices

IEEE 1394 FireHost	Dual IEEE 1394 ports, 400 Mbps, fits in PCI slot
FireDrive®	Hard drive enclosure with FireWire®-to-IDE interface
IEEE 1394/IDE Controller	FireWire®-to-IDE hard drive interface

Specialty Boards

PCI	8255-PIO	8255 PIO interface card

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