

## **Holman's HAND Irrigation Controller Uses Connect One iChip Internet Controller for Hands-Free Connectivity**

*"Connect One's iChip has been a quick and cost-effective solution to our connectivity problems. It has allowed us to flawlessly connect our products to the Internet with only marginal changes to our current software and hardware designs."*

-Barry Wood, R&D Manager, Holman Industries

Holman Industries, based in Perth, Australia, manufactures and designs embedded systems for irrigation control equipment. They have targeted the domestic Australian market with low-cost, entry-level equipment and have recently turned their attention to the American market. Because their market segment is small and very much a niche market, they prefer to do all design work in-house.

### **The Challenge**

Holman Industries set out to design a device that would provide professional landscapers with a service giving them a distinct edge over stores selling a do-it-yourself irrigation installation. Holman's HAND (Home Automating Network Device) irrigation controller is designed sense flow and pressure of the irrigation system and includes a patent-pending moisture and nutrient sensor system for soil monitoring. HAND uses email to send information back to an irrigation service provider when faults occur or when maintenance is required. It is also designed with the capability to be dialed up and browsed like a common server. This will allow the consumer or service provider to remotely change parameters such as start times and watering duration. The device should also connect to a GSM wireless modem, power line modem, Bluetooth device, and 10BaseT LAN.

Barry Wood, Holman's R&D manager, spent many months evaluating Internet connectivity products in the market. According to Barry, "For us to write and implement a full PPP system with a TCP/IP stack and high-level Internet protocols was not only going to be expensive in the first instance, but was also going to be expensive to maintain as the Internet evolved. This was when we started to look for a stack that we could purchase."

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In April 2000 he began to look for an Internet protocol stack that he could buy at a realistic price. Barry hoped that such a protocol stack would be easy to integrate and include on-going upgradeability. This turned out to be a bigger task than he had first thought. He played around with development kits from many suppliers, but none offered what he wanted at the right price.

### **The Solution**

As his search continued, Barry realized that the greatest challenge he faced was accepting the fact that Holman is not an Internet-savvy company. “Our skill levels cover communications and embedded systems, but the Internet and the associated protocols are an issue for specialist software houses,” Barry said. “It became obvious quiet early that we needed a partner to cope with the Internet side of our project,” he continued.

In July 2000, Barry investigated the idea of an Internet peripheral chip, and compared the products on the market. After discovering Connect One, he ordered and received samples of iChip CO561AD-S in September 2000. The first prototype was built in April 2001.

In order to enable Internet connectivity via modem, Barry embedded Connect One’s iChip CO561AD-S, which supports both dial-up and wireless modems. Thus no additional engineering, hardware, or software programming was required. Connect One provided Holman with a reference design for the Silicon Laboratories Si2400 ISOModem 2400 bit-per-second modem chipset, which Barry selected. He also wanted to support GSM wireless technology, which was added to improve accessibility where phone lines are not easily available. Connect One also provided a reference design for using an external wireless modem.

Holman also wished to connect their controller to a LAN. Holman selected Connect One’s iChip LAN CO561AD-L for 10BaseT connectivity. Connect One provided Holman with a reference design for iChip LAN with Crystal’s CS8900A Ethernet controller, which Holman also designed into their board.

Bundled with each of these products is Connect One’s AT+i™ protocol, a high-level command set that eliminates the need for Internet programming. The AT+i command set simplifies integrating the Internet protocols and configuration parameters in the host application, because it requires adding only a few lines of code with AT+i commands to the host application. And because iChip uses flash memory for storing its firmware, the Internet protocols and configuration parameters can be remotely updated over the Internet.

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Commenting on the Connect One solution, Barry said, "What they supplied was perfect for us. We ended up with a modular pack that we could add to nearly anything we did. At the same time, they maintained it by providing evolving software that could be downloaded regularly to the end-user by the Net."

### **Technical Implementation**

Holman's HAND uses a 20 MHz Rabbit 2000 as the main processor, and includes 4MB flash and 1MB SRAM. A color touch-screen LCD was added for more user-friendly control. The device has four serial ports: one will be used for a Bluetooth interface, one for a Crystal CS8900A 10BaseT Ethernet controller, one will be shared by the SiLabs dial-up modem and a Siemens M20T GSM modem, and one will connect to a Domosys power line modem.

Designing the product fell within the guidelines of numerous products that Holman had developed in the past. So from a technical standpoint they had all the necessary intellectual property to cope with the balance of the project. There were certain issues pertaining to power requirements of the GSM phone system, but all these were fairly easily addressed.

By using iChip, Holman have made only minor changes to the way they do things. "From our point of view it was no harder than adding a modem to our product. In all I would suggest the whole project has been a fairly painless experience for us, largely due to the ease of an embedded chip solution." Most of their communications solutions already included a form of TCP, so the extension to the Internet did little to affect the way they do things.

After making their first prototypes in April, Holman spent the next four months on software development and production set-up. Currently Holman are preparing some short production runs and will start delivering samples to their key customers in September 2001. The product is planned to be released at the Irrigation Association of America (IAA) show in San Antonio, Texas in November.

According to Wally Edwards, president of Holman Industries, "We are very happy with how this project has turned out. Connect One enabled us to focus on developing our core technology, while they provided and will maintain the Internet connectivity portion. Their flexible solution meets all of our requirements."

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Block Overview Of Irrigation controller Interface

