SIMPLE CIRCUITS
Wireless Wire
By Jeff Alder, CET

Hello and welcome to Simple Circuits!

As some of you may recall, in the July – August 2009 issue of the IMSA Journal, I introduced a new technology known as Wireless Wire. Wireless Wire is manufactured by Deltatee Enterprises, Ltd., located in Calgary, Alberta.

The premise of Wireless Wire is to provide a contact closure based wireless link which, in virtually every way, imitates a true wired connection, without an actual wired circuit.

Wireless Wire is based on the 2.4 GHz, 802.15.4-2006 "ZigBee" wireless platform, which operates within the industrial temperature range of -40C to +65C, 100% humidity (non-condensing).

Wireless Wire networks require a "Coordinator" module, which forms the actual network, and as many "Remote/Router" modules as are required, to make up the specified network itself.

Thirty-two remotes are a typical maximum standard network, but more can be added should the application require.

Laptops and software drivers are not required to configure these products and they can usually be plugged and played right out of the shipping carton.

The original contact closure Wireless Wire requires that a channel select jumper be moved to dictate which of two channels the module will operate on. This has since been replaced by a slide switch, and that is the extent of any programming requirements.

Operation of Wireless Wire is simple and straightforward: If input 1 of any wireless modem in the network is shorted to ground, all other associated pin 1's on every module connected to that particular wireless network are also immediately shorted to ground, just as if they were wired together.

All contacts may function either as inputs or outputs.

This means that they are able to accept an open or short to ground as an input, yet sink up to 2 amps DC, with pull-up voltages to 250 VDC, in order to drive output loads as required.

This makes life simple for applications such as simultaneous activation/deactivation of flashing signs etc., from a single location.

Because all remote units also automatically function as repeaters, distances can be extended and the network is self healing.

Wireless Wire modules operate on power supply voltages of 6 – 42 VDC and require a max. current of 100mA during transmit bursts while drawing 30mA average.

All the I/O pins are solid state in nature so users enjoy the long life benefits not seen with mechanical devices such as relays.

Unused I/O points can be fed back to the rest of the network as a confirmation point, indicating that a contact closure output has occurred at a particular location.

Initial response to Wireless Wire from the traffic industry has been very favorable and I thank you for all your inquiries in that regard.

In this edition, I would like to review the significant product expansion which has been added to the Wireless Wire product line.

No more is Wireless Wire but a simple contact closure solution. Working closely with Original Equipment Manufacturers, Deltatee has added a family of optional expansion modules. Each Wireless Wire can accommodate one optional daughter board (module). These modules can be factory installed or added later by the OEM.

Wireless Wire now encompasses a variety of analogue, digital, USB, serial, cellular and web interface capabilities, all of which can provide much needed short haul wireless interconnect, convenient for use within the traffic and transportation industry.
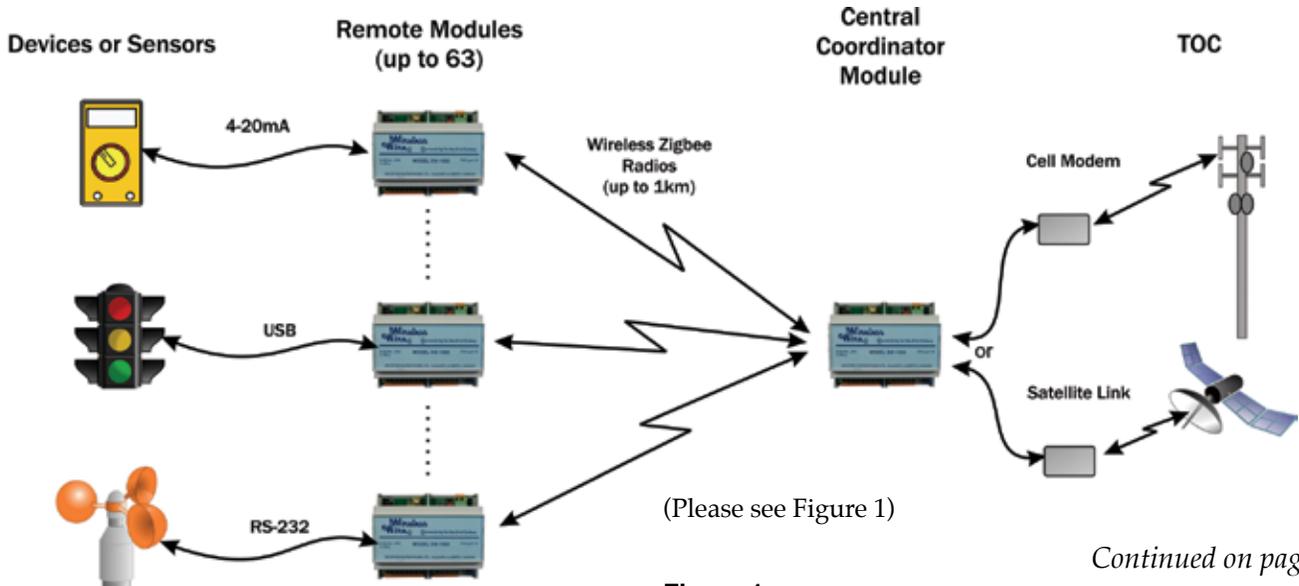
Figure 1

The new expansion modules have slightly increased jumper and dipswitch based configuration because of the greater functionality they now provide.

Aside from the standard base module which provides 8 I/O points, and the optional expander of 8 further I/O points for contact closure operation, there are now 5 more optional modules providing users with amazing new capabilities.

The original expansion module of 8 D I/O points essentially "uses up" the second channel capability of the digital I/O base module.

The first 8 I/O points at an installation are delegated to Channel 1 and the second 8 I/O points assume Channel 2 connectivity. If an installation site has only the base module of 8 I/O points, then those points can be programmed for Channel 1 or 2 connectivity.

The first of the new modules (Daughter Boards) introduced for Wireless Wire is a USB Device Board. The USB on this module is connected to, and enables a PC to query and set various I/O on the Wireless Wire network.

All field interface Daughter Boards that have data which is to be polled or programmed by a PC will relay their information back to the PC's USB port through this new module.

Wireless Wire USB modules will permit a maximum network wide data throughput of 275K in point to point USB applications.

The next set of modules is called, Peripheral Boards. These contain serial ports or a USB port to the network. If necessary, custom device drivers can be provided to interface with OEM equipment.

The Peripheral Boards are designed on a powerful ARM processer based architecture platform.

As mentioned earlier, a Peripheral Board which connects to field devices, must communicate back to the PC via the aforementioned USB Device Board.

Essentially, any device which would normally communicate to a PC directly through the PC's USB or Serial port can now communicate wirelessly with ease using Wireless Wire!

A simple application might be "drive by" program downloads to a traffic controller. Why get out of your truck, open the cabinet, connect a cable and fire up your laptop on the ground beside the cabinet as you kneel to download new programming to the controller?

Why not park your truck, and from the comfort of your vehicle, download the new database over a simple and inexpensive wireless link? (Please see Figure 2)
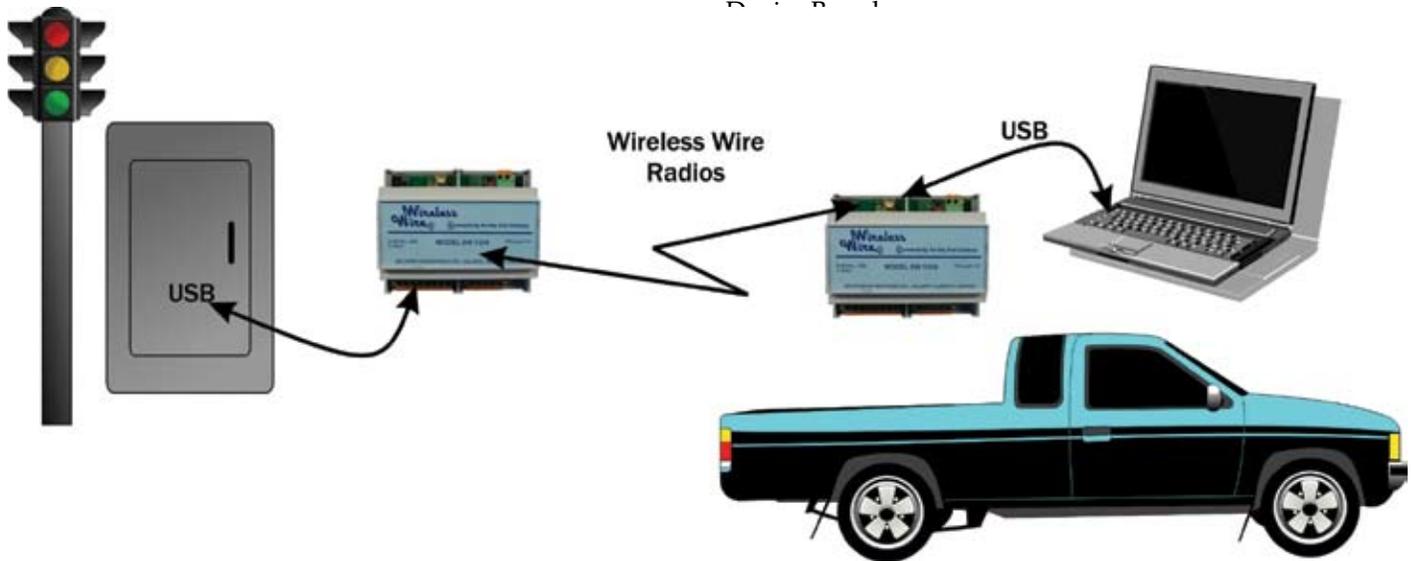
Figure 2

The third new module is the Serial Relay Board. This Board provides users with a wireless serial link allowing baud rates of up to 115K. Up to 16 pairs of serial links can exist in each network.

One can now, for example, provide a serial link for programming a controller, while simultaneously providing PTZ camera control over a single, wireless, dual channel RS-232 interface.

The port configuration switches associated with this peripheral are used to select baud rate (up to 115K), as well as hardware flow control enable and the number of stop bits.

Wireless Wire cellular modem capability allows both serial and/or peripheral data to be accessed easily at the TOC or over the Internet from anywhere in the world. (Please see Figure 3 on page 24)

Venturing into new territory,

a fourth module called the Analog Board provides users with 4 analog input ports and 2 analog output ports.

The analog input ports currently support 4-20 mA or 0 – 2V analog inputs. These analog ports can be connected to devices such as temperature sensors and weight sensors etc. The analog inputs are converted to a digital value which can be polled by an end users application as required.

The end user can also send a digital value which will be reconstructed as an analog output, should an application arise that requires it. Analog output applications for Traffic tend to be rare compared to that of other industries which employ Wireless Wire, such as Oil and Gas.

For polled analog applications, dip switches are not required as the USB Device board, which is implemented at the other end of the wire-
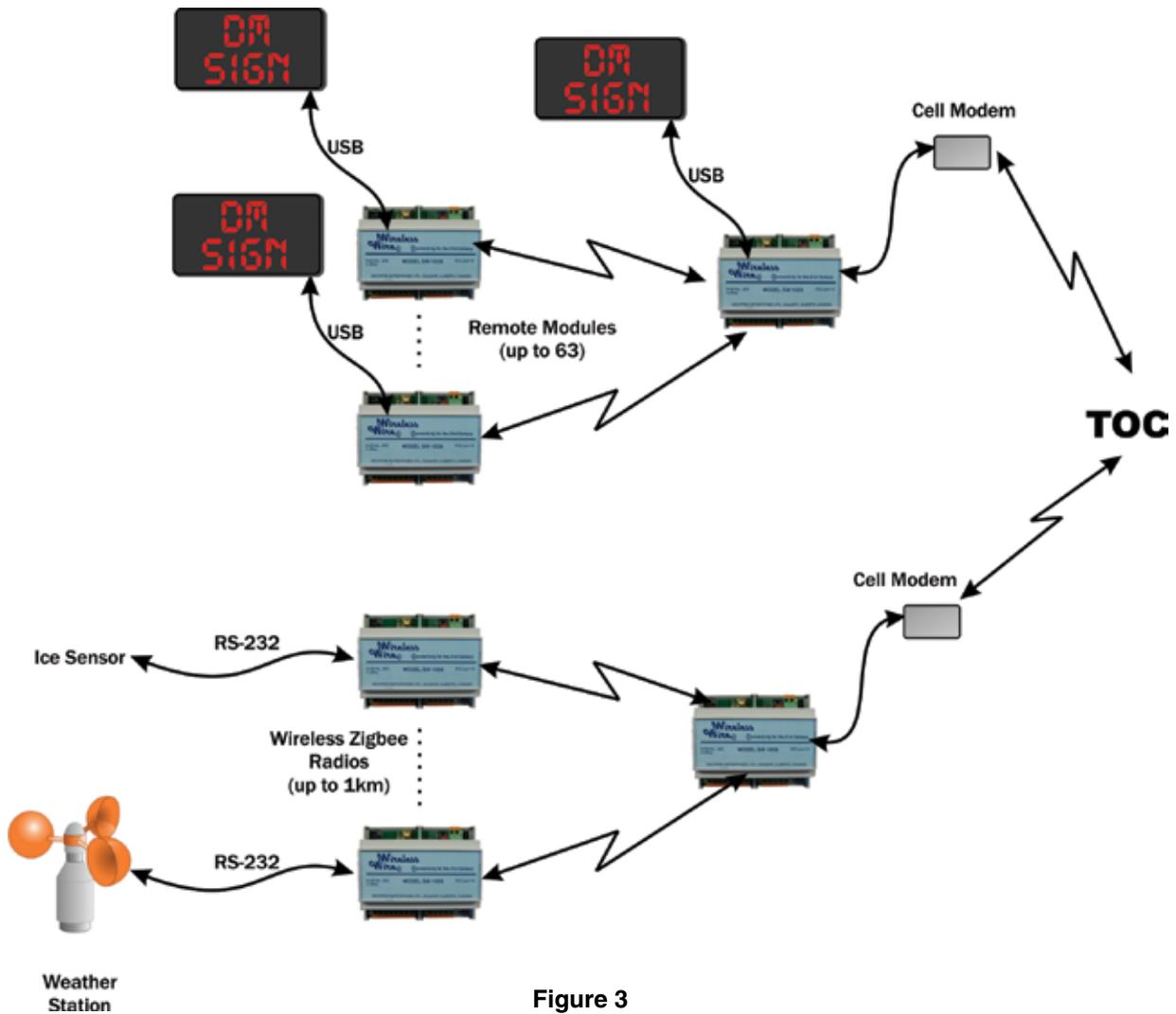
Figure 3

less link, takes care of the communications requirements. The USB board provides the control for the analog polling function based on instructions from the PC.

For analog relay functions there is an Analog Relay Module. This module provides 2 analog inputs and 2 analog outputs. The analog inputs are read, digitized and transmitted to a receiving module which reconstructs transmitted data values into analog outputs. Up to 16 pairs of Analog Relay Boards may be present on a single network.

Analog values are digitized and transmitted up to 10 times per second.

With all Wireless Wire modules loss of a wireless link is immediately noted and an error code is communicated to the application.

Installation of Daughter Boards is fast and easy. Simply snap off the plastic faceplate, insert the Daughter Board into a 26 pin header, secure the board with a machine screw, and replace the faceplate.

Each Base Wireless Wire module can accommodate 1 Daughter Board.

The cost to OEM's of these Base Module and Daughter Board combinations is surprisingly low at 25 to 50% of the price of current industry contact closure product offerings.

The great thing I have found in working with Deltatee,

is that their business model is that of a <u>Wireless Manufacturer</u>. Deltatee supports OEM product development, period. They would never consider developing applications, etc. which might compete with a potential customer, such as a wireless school zone sign controller, for example, although they are more than capable.

Instead, Deltatee tailors their products based on their customer's requirements. On board custom drivers, dip switch functionality, etc. are all easily customized within the design structure of Wireless Wire.

Deltatee is a manufacturer pure and true. This gives me good piece of mind as I forge ahead with applications of my own. More on that later…

I would like to thank Gary Gunthorpe, President of Deltatee Enterprises, for his assistance in the writing of this article, and for the graphics and permission of their use throughout.

For further information on Wireless Wire products, please contact Gary directly at (403) 250-3533, Ext. 222, or visit the Wireless Wire website at <u>www.wirelesswire.ca.</u>

There are truly some untapped opportunities in Traffic and Transportation, so put your thinking caps on and let's exploit this inexpensive and innovative wireless technology!

Until next time, take care out there!

IMSA