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Automation NOTEBOOKTM

Winter 2009

Issue 13

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The Last Crusade

Legendary Oilman T. Boone Pickens Is on a Quest to
Convert How America Propels Its Economy



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small, easy-to-use PLC



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Automation NOTEBOOK

Your guide to practical products, technologies and applications

Contributors

Publisher	Tina Crowe
Managing Editor	Joan Welty
Coordinating Editor	TJ Johns
Design Manager	Justin Stegall
Contributing Writers	Tom Brickey Shane Crider John Decker Brian Elliott Jeff Payne Greg Philbrook Pat Philips Mike Sabatine Keith Schmitz

CONTACTS

Automationdirect.com Inc.
 3505 Hutchinson Road
 Cumming, GA 30040

Phone 1-800-633-0405
 or 1-770-889-2858
 Fax 1-770-889-7876

Monday - Friday
 9 a.m. to 6:00 p.m. EST

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For those who prefer to speak with us in person, please call 1-800-633-0405 x1845. Thanks for your interest, and we look forward to hearing from you.

Editor's Note

We experienced many historical events in 2008. We felt the pain of gas prices over \$4 per gallon. The housing market tumbled. Many banks collapsed. Unemployment rates skyrocketed. Plus, it was an election year. For the first time in history, seeking change, Americans elected an African-American president.

2008 was a year of trial. This new year will be challenging. But with courage, we will continue to advance.

Dorothy Thompson said, "Courage, it would seem, is nothing less than the power to overcome danger, misfortune, fear, injustice, while continuing to affirm inwardly that life with all its sorrows is good; that everything is meaningful even if in a sense beyond our understanding; and that there is always tomorrow."

In this issue of Automation NOTEBOOK, you will find an interesting article, from guest writer Keith Schmitz, regarding alternative energy. We also have information about new products, such as the CLICK PLC, and an article concerning a new format for our 2009 Webinars. Plus, two user solution stories explain interesting ways to use our products.

As 2009 ramps up, we look forward to what lies ahead. Expect new products throughout the year. And, as always, count on the free award-winning support from both our technical support and sales team.

Now, grab a cup of coffee, sit back, turn the page, and enjoy...

TJ Johns

TJ Johns
 Coordinating Editor
editor@automationnotebook.com

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New Product Focus

What's New



AutomationDirect releases small, easy-to-use PLC



The CLICK® PLC is the first in a new generation of inexpensive PLC components designed to offer practical features in an easy-to-use, compact yet expandable design. Starting at \$69, this line of micro brick PLCs with stackable I/O modules and free programming software is suitable for first time users as well as experienced programmers.

By itself, a powered CLICK CPU unit can function as a complete PLC system. The unit features eight inputs and six outputs, available in four combinations of built-in I/O types. For expansion, eleven option modules, starting at \$33, are available for flexible system configuration, up to 142 I/O. All Click CPUs support 8K steps of Flash EEPROM program memory and 8K words of data memory. Two 24 VDC power supply options, with either 0.5A or 1.3A outputs, can be used to power the PLC.

The CLICK PLC system's space-saving design requires no mounting base; up to eight modules can be attached to the

CLICK CPU module via an integrated expansion port on the sides of the modules and secured by locking tabs on the top and bottom of all modules.

CLICK CPU units, starting at \$69, also feature two built-in RS232 RJ12 communications ports. One port supports MODBUS RTU protocol only and can be used as the programming port. This port can also connect the CPU to a MODBUS RTU network as a slave device. The second port is a general purpose port with user configurable communications parameters and supports either MODBUS RTU or ASCII protocols. Both communications ports supply 5 VDC, allowing connection of the *C-more* Micro HMI panel without an additional power supply. LED indicators located at each port indicate when the port is transmitting or receiving.

CLICK features user-friendly programming software, downloadable for free at www.automationdirect.com. The tools, layout, and interactivity allow quick and intuitive program development. The 21 practical instructions, a combination of Relay ladder logic and Function blocks, are supported by a comprehensive programming environment with easy navigation and a familiar look and feel. In addition, an online help file provides information to help users get acquainted with the software quickly.

As part of the CLICK line of products, pre-wired I/O cables are also available. Available in pre-wired and ready-to-wire configurations, the cables help eliminate the labor-intensive process of wiring PLC I/O to terminal blocks. Prices for the cables start at \$16.50.

"By working faithfully eight hours a day, you may get to be a boss and work twelve hours a day."

— Robert Frost

Introducing the practically free PLC

it's so simple, we called it CLICK



Complete PLC starting at \$69

At \$69.00, you get a ton of application control for your automation buck. The new CLICK PLC was designed for novice and expert users alike. Download the FREE programming software and see for yourself!

Mighty as a stand-alone unit, or expand to 142 total I/O

- Four stand-alone DIN-rail mountable DC-powered CPU combinations including:
 - 8 DC In / 6 DC Out (sinking)
 - 8 DC In / 6 DC Out (sourcing)
 - 8 DC In / 6 Relay Out
 - 8 AC In / 6 Relay Out
- Two built-in communication ports
- Removable terminal blocks for easy wiring
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- 21 consolidated yet powerful instructions
- Supported by FREE, high-feature programming software

CHECK OUT JUST A FEW PRICES ON CLICK

Product Description	AutomationDirect CLICK Price/Part Number
PLC Module with 8 DC inputs / 6 DC outputs (sinking), two communication ports	\$69.00 CO-00DD1-D
Auxiliary power supply (0.5A), 100-240 VAC input, 24 VDC 0.5A output	\$29.00 CO-00AC
AC input module, eight 100-120 VAC points	\$40.00 CO-08NA

AutomationDirect prices are U.S. published prices as of October 2008. Prices subject to change without notice.

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AutomationDirect adds 600A Fuses



AutomationDirect has added to its offering of Edison class RK1, class RK5, class J, and small dimension fuses for industrial control applications. Class RK1 fuses now offer 200A to 600A sizes, starting at \$32.25, and are designed for electrical safety upgrade applications. Class RK5 fuses are now available in 225A to 600A ratings, starting at \$39.25, and are ideal for time-delay motor circuits and building systems. The class J dual element time-delay fuses, now in 225A to 600A sizes, start at \$127.00, and provide superior time-delay to pass harmless motor or transformer surges. Now available in small dimension fuses are 32mA fast-acting glass fuses, available for \$7 (for a 5-pack). An assortment of fuse blocks has also been added to accommodate 100A to 600A applications. Prices for the new fuse blocks start at \$25.50. Learn more about Edison fuses at: <http://www.automationdirect.com/fuses>

AutomationDirect introduces Power Distribution blocks



AutomationDirect announces the launch of a line of Edison power distribution blocks and terminal blocks. The distinctly different styles of short-circuit current rated (SCCR) power distribution blocks and terminal blocks are designed to support different application needs.

Edison's finger-safe power distribution blocks EPDB series feature a modular design allowing users to configure the number of poles required by each application. Ideal for today's power circuit requirements, these blocks accept copper conductors and maintain an SCCR rating of 200kA, with proper fusing. The finger-safe blocks are suitable for both factory and field wiring and are rated from 175A to 760A. Most finger-safe blocks are DIN-rail mountable; prices start at \$8.25.

Edison open-style terminal blocks PB series are offered as a convenient way to manage power distribution needs in factory and field settings. Surface-mountable, they are engineered to maintain an SCCR rating of 200kA with copper conductors and 10kA for aluminum conductors. Ampere ratings of up to 760A make these blocks ideal for use in UL508A panels for branch circuit applications. The terminal blocks, starting at \$6.75, are available in single, double, and three-pole configurations. For greater protection, safety covers are also available, starting at \$1.50. View the full line of Edison power distribution blocks and terminal blocks at:

<http://www.automationdirect.com/power-blocks>

AutomationDirect offers full line of cutting tools



A complete line of RUKO cutting tools, including step drill bits, jobber length drill bits, machine taps, and knockout punches is now available.

High performance split-point step drill bits are CBN (cubical boron nitride) ground from a solid hardened form to provide spiral flutes without burrs and a superior cutting edge. The CBN-ground point ensures centering and spot-drilling, even in thin-walled material. Step drill bits are available in high-speed steel and titanium nitride-coated high speed steel and are designed for sheet metal working in electrical, sanitary engineering, heating technologies, automotive, mechanical engineering, switching systems, and aviation applications. Step drill bits are available individually and in a convenient three piece kit. Prices start at \$14.75.

For normal drilling in conventional materials, jobber length drill bits are made of heavy-duty high-speed steel. Designed for applications such as steel and stainless steel, alloyed and unalloyed cast iron, sintered iron, nickel silver, graphite, brass and bronze, jobber size drill bits are available in high speed steel and titanium nitride-coated high speed steel. The jobber length drill bits, available in packs of 5 or 10 and in 21 or 29 piece kits, start at \$4 for a 10-pack.

Coarse and fine thread machine taps are available in nine sizes, are constructed of cobalt-alloyed high speed

steel, have a reinforced shank for through threads, and feature a spiral point. Unified coarse thread taps are available in sizes ranging from 4-40 to 3/8-16 while unified fine thread taps range from 4-48 to 3/8-24. Machine tap prices start at \$6.50.

Knockout punch hole-cutting tools include a punch, die and draw bolt. Ideal for use with sheet steel, stainless steel sheets, non-ferrous and light metals, and up to 8 gauge plastic, thin materials cut quickly, easily, cleanly, and without burrs. The three-point cut ensures less deformation of the punched parts while preventing damage to the draw-in bolt. The optional replacement draw bolt with a ball bearing between the draw-in bolt and die plate reduces the punching force required by up to 67%. Replacement draw bolts, with the ball bearing, are available in three popular sizes. Prices for knockout punches start at \$20.75. To see the full line, visit: <http://www.automationdirect.com/tools>

New Series of Hammond Control Power Transformers



AutomationDirect now offers the PG series of 120x240/12x24 VAC HPS Imperator control power transformers as an addition to the existing 240x480 / 120x240 VAC MQMJ series. Designed to meet industrial applications where electromagnetic devices, such as relays, solenoids, etc. are used, they maximize inrush capability and output voltage. These transformers are 50/60 Hz, 600V class, machine tool rated with VA range

from 50 VA up to 1500 VA. They are cUL Listed, CE Mark, and RoHS Compliant. The new PG series transformers start at \$30 and optional finger safe terminal covers and primary side fuse kits are also available. To see the full line, visit:

<http://www.automationdirect.com/powerandaccessories>

IronHorse™ Line Now Includes Industrial C-face AC motors



AutomationDirect's IronHorse™ general purpose AC motor line now includes the industrial duty cast iron C-face style. Available in 1 to 300 hp, all motors have a base speed of 1800 RPM and are electrically reversible. The TC frame TEFC motors feature ribbed cast iron frames to ensure maximum cooling. Starting at \$130, these motors are ideal in conveyor, pump, fan, and textile processing applications. IronHorse general purpose motors are available for same-day shipping and are backed by a two-year warranty. See the full line on general purpose motors at: <http://www.automationdirect.com/ironhorse-motors>

New generation of PLC ZIPLink wiring system



The latest ZIPLink connection system reduces the time to wire DirectLOGIC and CLICK PLC I/O modules to terminal blocks. ZIPLinks use half the space at a fraction of the cost of traditional terminal block wiring arrangements. A complete selection of connection cables for discrete and analog modules is available in three pre-wired lengths; feedthrough, fused, interposing relay, sensor and transient voltage suppression connector modules offer flexible options for field wiring termination. Prices start at \$18 for feedthrough connector modules and \$16.50 for associated PLC connection cables. The new line is not a pin-for-pin replacement, so if you are replacing existing parts, you will need to replace both the cable and the connector module.

View the full line of ZIPLinks and a helpful cross-reference chart at: <http://www.automationdirect.com/ziplinks>

"If your work speaks for itself, don't interrupt."

— Henry J. Kaiser

Cover Story

The Pickens Plan

The Last Crusade

Legendary Oilman T. Boone Pickens Is on a Quest to Convert How America Propels Its Economy

by Keith Schmitz,
Guest Writer

The issue of energy, what it costs, what it is going to take to find more of it, and what it is doing to the planet is a hot topic. So hot that there are a million voices clamoring with solutions about how American can change its energy consumption habits and wean itself off of foreign oil.

Some have sounded the warning against the status quo around the climate change issue, but up until now no one has laid out a blueprint that has gotten much notice on how to get to self-sufficiency. But when you have a personal fortune of four billion dollars like 80-year old oilman T. Boone Pickens, chances are you are going to be heard.

Pickens, on July 8th, 2008, announced his Pickens Plan that teams up natural gas and wind power. Pickens believes he has the money, expertise and arm-twisting ability to get it done. As Pickens put it to Charlie Rose on 60 Minutes, "my father told me 'a man with a plan can beat a genius with no plan.'"

As long as the United States controlled the source for oil the public put little thought into where their next fill-up was coming from as they pulled into their full-service gas station. Then in the 1970s the country learned of a new four-letter acronym – OPEC – the Organization of the Petroleum Exporting Countries.

In organization, the oil-producing countries found muscle and they flexed it, reducing output at will for political reasons and recently out of concern that the world is reaching peak production.

Whether or not we are at that point is a topic of debate but the dynamic growth of third world countries has

certainly created a demand, which until the recent economic downturn had driven up the cost of oil to the point where gasoline in this country climbed to over \$4 a gallon.



T. Boone Pickens is currently the chairman and CEO of BP Capital, which operates energy focused commodity and equity funds. He is also the largest shareholder in Clean Energy, the largest provider of vehicular natural gas (CNG and LNG) in North America with a broad customer base in the refuse, transit, shuttle, taxi, police, intrastate and interstate trucking, airport and municipal fleet markets.

Photo ©: T. Boone Pickens (The Pickens Plan)
<http://www.boonepickens.com>

Energy plays a major role in the U.S. economy. For a country with an estimated gross domestic product for 2008 of \$14.3 trillion dollars, Pickens puts the amount of imported oil at \$700 billion, though the U.S. Department of Energy sets the figure at \$327.8 billion. Of the total energy used in this country, 84% of it comes from fossil fuels, for transport, industrial and domestic use. The balance comes from primarily hydroelectric and nuclear power stations.

Having been in the oil business for the past 60 years, T. Boone Pickens is well acquainted with the U.S. energy market, and he has gotten behind The Plan with a media blitz that rivals a national presidential campaign. In fact, his commercials, part of the \$58 million campaign funded out his own pocket, were audaciously running simultaneously with Senators McCain and Obama's spots on all media.

Fueling the plan itself goes beyond T. Boone's money and involves canny grassroots and netroots organizing. Everywhere he appears he urges people

to go to his site to become part of his New Energy Army. Pickens hopes to have two million supporters by Barack Obama's inauguration.

Pickens has appeared in virtually every broadcast and print medium, most recently on the Daily Show appealing to Jon Stewart's youthful audience to join his movement and garnering wild applause.

Supporters and critics of The Plan come from unlikely places. Senator Harry Reid (D-NV) told CBS News, "Here is a man who was my mortal enemy. He's my pal now." Carl Pope came on board at the onset, proclaiming in the Huffington Post, "To put it plainly, T. Boone Pickens is out to save America."

Some conservationists slam The Plan for its reliance on natural gas, replacing one fossil fuel for another. Many conservatives are uncomfortable with the role government plays in the proposal.

Recent financial conditions have lessened the impetus for The Plan. Much of the economic propulsion to consider a switch over to natural gas and wind power has been the steep rise in the cost of energy. Recently the price of gas has slid below \$2 per gallon. Not only has the drop made alternatives less attractive, but the failing economy which led to the decline is even impacting Pickens.

Tightening credit has led Pickens to scale back on his multi-billion dollar Pampas Wind Project. Half the investors asked to withdraw their money.

But if Pickens has one quality it is tenacity. As he told Tom Brokaw on Meet the Press about his wind project, "I had planned on 30 percent equity, 70 percent debt, and I can't get any, any, any money for that at this point. But it doesn't mean that's the end of it. It's been postponed is all it is."

And Pickens also knows how to make connections, which he has with the incoming Obama administration. Prospective White House chief of staff Rahm Emanuel in an interview posted

on the Pickens Plan Web site expressed his agreement with The Plan.

No matter what the outcome of America's energy future, with Pickens' experience in making money and finding oil, his billions in personal fortune and the millions in his Energy Army, his influence on this issue cannot be ignored and he is sharpening national attention on the energy issue.

The Basics of the Pickens Plan

Launching the plan on July 8th, 2008, Pickens in his opening statement on the Pickens Plan says, "America is blessed with the world's greatest wind power corridor and abundant reserves of clean natural gas. The Pickens Plan will utilize these tremendous resources to build a bridge to the future, a blueprint to reduce foreign oil dependence by harnessing domestic energy alternatives and buying time for us to develop even greater new technologies."

The Pickens Plan lays out how we can cut oil imports in half.

1) Replace petroleum with natural gas in road vehicles.

Pickens believes the amount of natural gas already available in this country would reduce imported petroleum to 38% of the total oil used in the U.S. To accomplish this part of the plan, a significant portion of the cars used in this country and other vehicles would have to switch over to natural gas.

Pickens sees natural gas as the heart of The Plan, touting it as being cleaner than gasoline, letting out 30% fewer emissions and more readily available, with 98% of the natural gas used in the United States coming from North America.

Continued, p. 11>>

Tilting with Windmills?



Byron Wind Turbines, Byron, Wisconsin
Photo courtesy of:
We Energies
<http://www.we-energies.com>

Experts say the bleak expanse of west Texas is the nation's wind energy sweet spot, with a near-constant wind speed of 17 mph, underused transmission lines, wide-open spaces and friendly landowners. On many Texas farms, windmills jut out among the grazing livestock. Farmers in some places can earn between \$5,000 and \$15,000 per windmill per year, funded by a company called Airtricity out of Dublin, Ireland.

Until now the Horse Hollow Wind Energy Center in Texas holds the record as the largest wind farm with a generating capacity of 585 megawatts. But of course T. Boone Pickens is looking to top that with his Pampas Wind Project, funded through his Mesa Power Company.

He plans to make an initial \$2 billion purchase of 667 GE wind turbines, part of a four-phase project that will eventually approach a \$12 billion investment to produce 4,000 megawatts. In the entire country a total of 5,200 megawatts of new wind power was brought online last year.

Of course GE, the world's second largest wind turbine manufacturer, is happy with the push from Pickens. GE's chair and CEO Jeffery R. Immelt proclaimed, "We're excited to partner with an energy visionary like T. Boone Pickens to bring our wind technology to the marketplace."

What are the odds that wind power can play a significant role in the U.S. energy picture? Currently wind provides just 1% of this country's electricity. The U.S. Department of Energy estimates that by 2030 as much as 20% of the nation's electricity could be wind-produced, thus reducing CO2 emissions by 825 tons annually. Pickens wants to reach that goal faster – in ten years – to replace the natural gas power plants in use now.

Not only must we make the electrical grid bigger, but it also has to be made better. Al Gore has pointed out that the grid is obsolete and based on 1950s technology. According to Kurt Yeager of the Galvin Electricity Initiative, using wind power and throwing in solar at the same time needs a smart grid system so that when one power source is dormant, the other is available. "The sun doesn't always shine, the wind doesn't always blow."

"The ability to accommodate that kind of intermittency is not possible unless we have large quantities of backup power or storage."

But of course, much of the utilization of wind power is dependent right now on federal tax credits and based on the price of other forms of energy. Along with putting up the money to increase wind-generating power, Pickens is also seeking to generate political power through his connections and his grassroots "Energy Army."

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Worm Gearboxes utilize C-face mounting interfaces for C-face electric motors

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CHECK OUT PRICES ON MOTORS AND WORM GEARBOXES

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Single-phase, 115/208-230 Volt 0.5 hp, TEFC enclosure	\$89.00 MTR-P50-1AB18
Three-phase, 208-230/460 Volt 2 hp, TEFC Enclosure	\$148.00 MTR-002-3BD18
Cast Iron (MTC)	
Industrial Duty three-phase T-Frame, TEFC enclosure, EPACT rated 2 hp 208-230/460 Volt	\$137.00 MTC-002-3BD18
Industrial Duty three-phase, C-face, TEFC enclosure, EPACT rated, 50 hp 460 Volt	\$1,375.00 MTC-050-3BD18CK
Worm Gearboxes	
Ratio 10:1 nominal 1.0 hp input, 1.75 inch center distance, dual shaft	\$130.00 WG-175-010-D
Ratio 60:1 nominal 0.75 hp input, 2.62 inch center distance, right-hand shaft	\$215.00 WG-262-060-R

AutomationDirect prices are U.S. published prices as of January 2009. Prices subject to change without notice.

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Cover Story cont.

The Pickens Plan

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2) Replace the natural gas used in power plants with wind power.

Part of the natural gas supply would come from replacing its use in generating electricity with windmills, funded by private investors. A forest of wind turbines would provide electrical power to the Midwest, South and Western parts of the country.

3) Build new infrastructure to distribute wind generated power.

All electricity users would pay for the power transmission lines to connect the windmills to the power grid at a cost of between \$64 and \$128 billion. Pickens compares building these new power lines to President Eisenhower's call for a national highway system in the 1950s based on Cold War defense needs.

To make this plan happen, Pickens has to depend on the stars aligning in the areas of technology, business, economics and public opinion.

Keith Schmitz Bio



Keith Schmitz is a business-to-business and technology writer based in Milwaukee, WI. He has written on a range of topics including electronics, HVAC applications, use of lean/SixSigma/TRIZ techniques, and hydraulics.

Industries he has been involved with include supply chain and material handling, manufacturing, mining, construction and medical.

Pumping up on CNG



CNG Dispensing System

Photo courtesy of:
IMW Industries Ltd.

<http://www.imw.bc.ca/products/dispensers.php>

The prominent role natural gas plays in the Pickens Plan as a replacement for gasoline in internal combustion engine-powered vehicles is a pet project for Pickens dating back to the late 1980s.

But before this country tells the Saudi royal family thanks but no thanks for their oil, the United States has a long way to go before more than just a handful of drivers fuel up on compressed natural gas (CNG). In the United States, there are 250 million registered gas-burning vehicles – almost one per person. By contrast, just 150,000 vehicles are currently propelled by natural gas.

Chances are few people have actually laid eyes on a CNG powered car let alone own one, and that one would only be the Honda Civic GX. Driving one of those cars means hunting for one of the just



1,200 natural gas stations nationwide, versus the 100,000 gas stations across the country.

Through his Clean Energy Fuels Company, Pickens intends to literally prime the pump by building an additional 35 to 40 stations. To further facilitate putting a natural gas car into the country's garages, Pickens bought a company which sells a home fueling device called what else – Phill – that lets people fill up at home from their natural gas line at an additional \$3,500 for the machine and another \$500 to \$1,000 to install.

Critics maintain that Pickens' idea is just replacing one fossil fuel with another, and that the focus should be on developing hybrids now and electric powered vehicles over the long run. Pickens counters that the real place for CNG is in heavy-haul trucks, "and that you can't run an 18-wheeler on a battery." He continues, "There are only three fuels that will move an 18-wheeler: diesel, gasoline and natural gas. We don't have diesel and gasoline, but we do have natural gas. Battery won't move an 18-wheeler. So I want to see all of the trucks, all new trucks, not retro-fit trucks, but all new trucks go to natural gas."

Yet in other places, natural gas powered vehicles are catching on with drivers. Italy and Canada boast the most CNG-friendly infrastructures.

The developing world seems to be the most interested. The number of natural gas cars is expected to triple in Thailand in the next four years. Pakistan, Brazil and Argentina each have 1.5 million CNG powered vehicles on the streets.

And when the natural gas stations proliferate, so do the number of natural gas powered cars, as in Utah. Right now there are 6,000 proud owners of natural gas vehicles in the state, with several hundred joining their ranks every month.

For complete details on the plan and Pickens' Energy Army, go to www.pickensplan.com.

PLC Speaking

LOW-COST PLC



Introducing...the Practically Free PLC

by Jeff Payne
AutomationDirect
PLC Product Manager



Figure 1, CLICK PLC

PLC Speaking has something new and exciting to talk about. AutomationDirect® and our parent company KOYO Electronics have released a new line of stackable micro brick PLCs - the truly innovative CLICK™ PLC. This product will have an immediate impact on the market with its \$69 list price. For this you get a stand alone CPU/PLC with eight digital inputs and six digital outputs which is easily expandable up to 142 I/O.

Our objective with this product was to strengthen our low-end PLC offering. Small systems integrators and original equipment manufacturers who have not previously considered PLCs for their projects and/or applications may find this a very attractive solution.

We realize one of the biggest deterrents for trying a new PLC control platform, or simply getting started with PLC control, is the cost. This is why we feel CLICK is the perfect PLC for most small applications.

The customer's learning curve is by far the greatest cost when starting a new control platform. The CLICK PLC programming software is a FREE download from our Web site, so there is no additional 'getting started' cost, no purchasing an expensive programming tool or recurring license fees and maintenance agreements. However, unlike many "FREE" programming packages,

this fully-functional software is packed with features to shorten your learning curve and reduce your programming time.

One of the many remarkable features is the reduced instruction set of 21 simplified, yet powerful programming instructions. Some people look at this and immediately suspect that this product cannot possibly satisfy their application needs with so few instructions. I challenge anyone to download the free programming package and see just what CLICK can do.

Like the CLICK hardware, the instruction set was designed with the customer in mind. You will find contacts, coils, set, reset, counters and timers, just as you would expect. However, what will astonish you are the function block designs. For example, the math instruction (Figure 2) easily adds two data registers, and also allows for free form entry of parenthetical expressions which can be nested up to eight levels. A complex expression such as $DS25 \wedge (2 * DS87) + DF11 * (1000 - 50) / 4095 * PI$ can combine multiple data types, and constant value with algebraic and transcendental operators. (Trigonometric functions can be solved in radians.)

Continued, p. 14>>

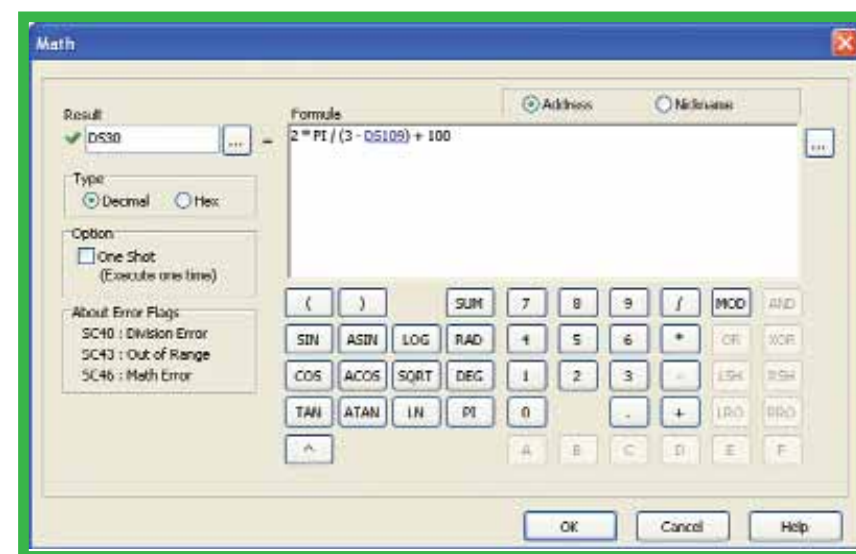


Figure 2, Math Instruction Dialog Box

Fuji Electric quality

At AutomationDirect Prices

DUO and Odyssey series motor controls up to 300 hp

Get Fuji Electric's best motor control solutions from AutomationDirect. With sizes up to 300 hp (at 480 VAC), this complete series of IEC contactors, overload relays, and manual starters offer you any motor control configuration you might need. Both the DUO and Odyssey line are available in 24 VAC, 24 VDC, 120 VAC, and 240 VAC coil versions.

- Order one or 100, you get our low everyday prices!
- In stock and ready for same-day shipping for orders received by 6 PM E.T. (with credit card or pre-approved credit)

Contactors are available with:

- Three compact frame sizes up to 300 hp
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- Finger protection terminals

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- UL 508E listed (Type E and Type F group motor rated)
- Two frame sizes up to 63 amps
- Up to 50 kA short circuit current rating (SCCR) at 480 VAC
- Thermal and magnetic protection
- Manual ON/OFF control with lockout capability



• Add a contactor, link module and base plate to create a combination starter

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40 Amp Contactor	\$46.00 SC-E2-110VAC	\$190.00 100-C37D00	\$219.50 CL06A311MJ	\$297.00 A40-30-10-84
10 Amp Motor Starter	\$46.00 BM3RHB-010	\$195.00 140M-C2E-C10	\$130.00 GPS1BHA	\$192.00 MS325-12.5

* This product includes 1 N.O. Aux contact
All prices are U.S. published prices. AutomationDirect prices are from October 2008 Price List. Allen-Bradley prices taken from <http://shop.rockwellautomation.com> 12/16/08. GE prices taken from <http://www.geindustrial.com> 12/16/08 except part #GPS1BHA price from <http://www.plccenter.com> 12/16/08. ABB prices taken from <http://www.abb-control.com> 12/16/08. Prices and specifications may vary by dealer and configuration. Prices subject to change without notice.



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PLC Speaking

LOW-COST PLC

Continued from, p. 12

That's just the math block. We have applied that same mentality to our timers (Figure 3) and counter, making it extremely simple to accomplish what you need with one instruction, whether an on-delay or off-delay, retentive or non-retentive, count up, count down, or both, etc. Simple selections within the instruction allow you to do exactly what you want to accomplish without having to search for the right instruction.

The Copy instruction (Figure 4) can move data, copy, block copy, pack or unpack words; it all depends on what you want to do. Plus, our graphical selections make your decision process super fast.

The CLICK Windows-based programming environment is intuitive and familiar if you have used our *C-more* products (Figure 5). The navigation pane provides quick and easy access to the most commonly used menu items required for designing, commissioning and troubleshooting a project. You can simplify program file management by using main program, sub-routine and interrupt program files, allowing you to easily see and organize all program files.

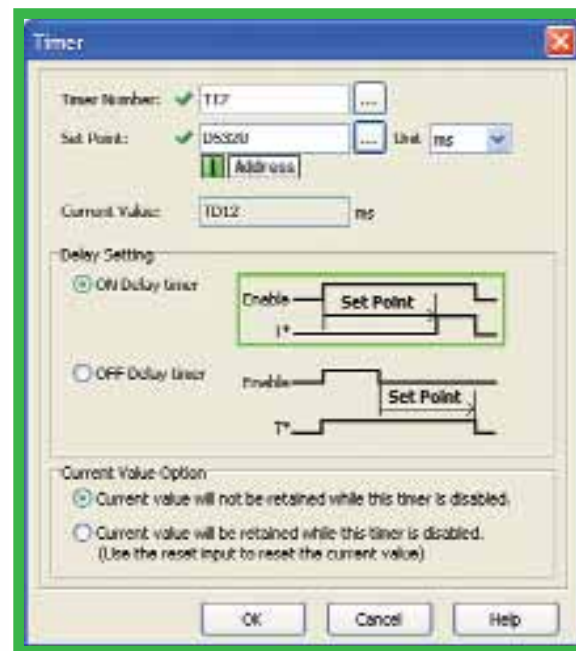


Figure 3, Timer Instruction Dialog Box

If you are familiar with DirectSOFT®, you will see tools which you are accustomed to, such as the DataView for monitoring real time data in your project, and a cross-reference view for identifying all locations where a specific instruction is used. You also have new tools, such as the address picker which allows you to view your entire PLC memory and the corresponding MODBUS addresses, assign nicknames, assign retentive or initial values, and add an address comment for each.

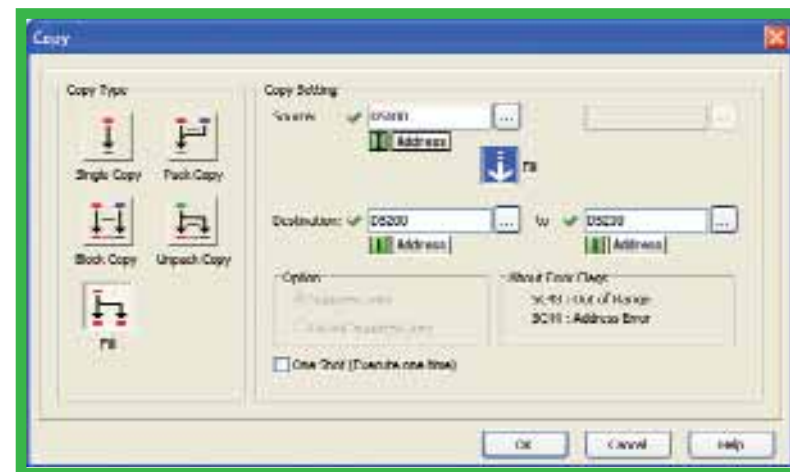


Figure 4, Copy Instruction Dialog Box

The Web based help file and software manual, both incorporated into the CLICK PLC programming software, are like having your own award-winning technical support staff right in your PC. And since the PLC retains all documentation within the downloaded project in the CPU, field troubleshooting is greatly simplified.

The CPU has two built-in RS232 (MODBUS RTU or ASCII communications) ports for programming, monitoring and communications to most any MODBUS-enabled device. The CPU also

has both master and slave capabilities standard with communications speeds from 1,200 baud to 115,200 baud.

There are some hardware restrictions with this initial release. At the outset this is a discrete only controller. We offer various input/output combinations of AC/DC and relays, both integrated into the CPU as well as optional stackable I/O modules.

The addition of process monitoring and control will be available soon with the introduction of our analog I/O

modules as well as a variety of CPUs with built-in analog control incorporated along with the discrete I/O.

If you need HMI for your application, the CLICK PLC and *C-more* Micro-Graphic panel were literally made for each other. You can use a single cable for communications and power between the two; plus, no additional power supply is required for the *C-more* Micro.

Available for the CLICK PLC is the ZIPLink wiring solution, offering the convenience of a five-second wiring solution from the I/O to a connector module. You can land your field wiring, eliminate additional terminal blocks and reduce the time it takes to build your panel (Figure 6).

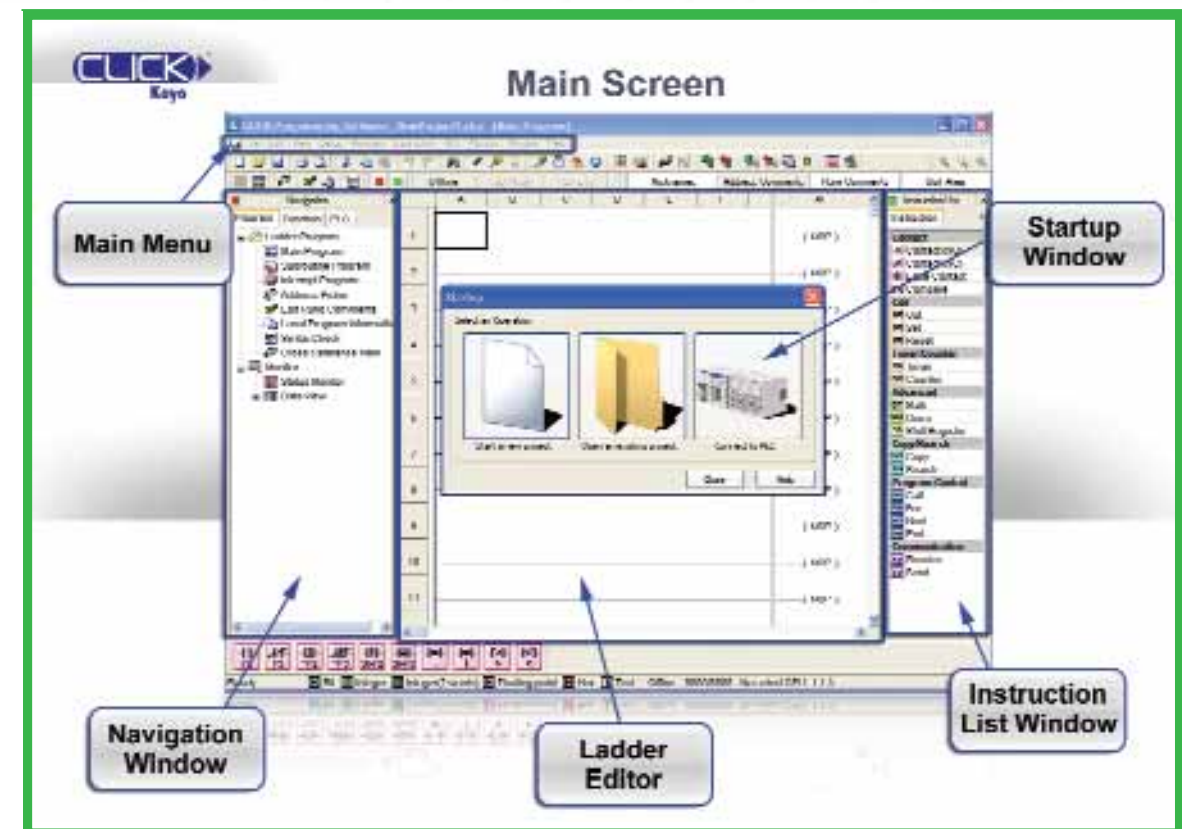


Figure 5, Startup Screen Dialog Box

You've heard the phrase, "Seeing is believing." To get the true experience of the CLICK PLC, take it for a test drive. Go to our Web site www.clickplcs.com for an interactive product tour which provides details of the product from hardware to software, pricing and even a direct link to the web-based software help file. From this site, you can add parts to your cart on our web store and link directly to the software download page.



Figure 6, CLICK PLC on DIN-rail with ZIPLink and C-more Operator Interface

Feature Story

off the grid

Alternative Energy Helps Industrial Controls "Cut the Cord"

By Pat Phillips
AutomationDirect,
Product Engineer

Let's say you want to improve safety on a remote section of highway through a mountain pass via a road condition monitoring system. A small automatic weather station beside the road plus several cameras in key locations could provide a good approximation of road conditions. This information could be posted on dynamic message signs along the approaches to the pass as well as on traffic monitoring Web sites. Maintenance and rescue personnel could be dispatched when needed based on real-time data instead of having to send inspectors to check conditions on the road. Sounds great, but what is the cost of implementing a system like this?

Thanks to modern electronics, the cost for a hardware installation in that remote mountain pass is shrinking every year. The bigger problem? Ten miles of transmission lines that must be strung across rugged terrain to power these helpful gadgets to make this road safer and more convenient for travelers. If only there was a way to power this system without ten miles of wire and all the poles to hold it up. ...

Today, there are new alternatives; alternative energy sources, that is. For a fraction of the cost and time to run ten miles of power line and hook into the grid, an off-grid power supply can have your new road monitoring system up and fully functional. Today, you can get electricity from the sun and wind for free (well, almost free). New fuel cells and improved batteries can keep everything running when the sun sets and the wind is calm. What's more, these new alternatives are following the path that

electronics has been on for decades: performance is improving while costs are dropping. That's more than the power company can offer!

Let's take a look at a few alternative energy sources available to help you "cut the cord" from the grid.

Solar Power



The sun sends more energy to the earth each day than we consume in a year. By using photovoltaic (PV) materials such as silicon, light energy from the sun can be converted into electrical energy that can be stored in a battery or used by an electrical appliance. PV material releases electrons in the form of direct current (DC) electricity when exposed to light. This phenomenon is known as the photoelectric effect.

Silicon wafers are made into PV cells which are connected in series and parallel to make up solar panels. Panels can be assembled to deliver whatever voltage and amperage is required for an application. Groups of panels can be connected together to deliver larger power outputs.

A new type of solar power generation is thin film photovoltaics. Instead of slicing silicon to make individual wafers which must be soldered into rigid panels, PV material is deposited directly on the substrate, essentially making one large solar cell for a fraction of the cost. The latest developments are adapting technology from the printing industry to produce rolls of PV material that are thin and flexible enough to fit nearly any contoured surface.

Of course, there is one significant drawback to solar power generation: when the sun stops shining, the juice stops flowing. Power output for a solar panel will vary based on the intensity of

the sunlight striking its surface. Reliable off-grid power systems therefore need to have a way to store energy (typically with batteries) to keep up with demand during dark hours. A robust control system to prevent overcharging batteries and to balance supply with load is also a must for industrial applications.

Wind Power

Man has been harnessing the wind for centuries. Wind turbines can now convert a stiff breeze into kilowatts. Large wind farms are being built all across the globe. While these wind farms are normally tied to the grid, smaller wind power systems can be used for off-grid applications like our road monitor in the mountain pass.



A modern wind turbine usually has two or three blades mounted to spin on a horizontal shaft; this shaft is coupled to an electric generator. Large turbines are usually set up to produce alternating current (AC) since they are connecting to the grid; smaller turbines typically produce DC electricity. As with sunlight on solar cells, stronger winds mean more power. Large modern wind turbines have servomotors to control blade angles and keep the turbine pointed into the wind to maximize power output.

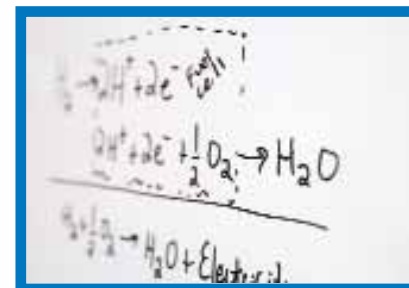
Wind power has the problem of fluctuating power output similar to solar unless you happen to be located in a rare location which is always windy. This means wind power systems also need batteries and controls to maintain power output at desired levels while protecting components. Initial cost of a small wind turbine can be quite low.

Fuel Cells

A fuel cell is an electrochemical device that converts a fuel and oxidant into electrical power. Unlike batteries, which are also electrochemical, fuel cells

consume the fuel and oxidant during the reaction to produce electricity. This means that a remote site will need to be visited periodically to replenish the fuel. Fuel cells can deliver significantly more power than traditional battery packs, making them a promising option to supplement solar or wind power systems off grid.

A fuel cell uses a chemical reaction to separate electrons and protons from the fuel and then force the electrons to travel through a circuit, thus creating electrical power. The typical construction uses a proton exchange membrane (PEM) to separate an anode and cathode. Fuel on the anode side reacts with a catalyst to split into protons and electrons. The protons pass through the PEM toward the cathode, but the electrons must flow out of the cell through the load to reach the cathode. At the cathode, the protons and electrons react with the oxidant to form waste products.



The purest form of fuel cell uses hydrogen fuel and oxygen to produce electricity and water. Other types use hydrocarbon fuels such as diesel or methanol and give off carbon dioxide and water as waste products. Although not as clean operating as hydrogen, these other fuels are often much easier to store and transport.

This is still a developing technology – look for significant advances in the years to come.

Now that we have a better understanding of what's available for off-grid applications, it's time to start thinking outside of the box! Here are a few ideas to get you started:

Telecommunications

This is not really outside the box since there is already significant use of

alternative power for remote telecom equipment. But, there is still room for more creative applications in the industry. Possibly small cellular phone towers could be installed around wilderness areas to allow hikers and campers to communicate with the outside world if the need arises.

Oil & Gas

For maximum efficiency, sensors and control equipment could be installed along pipelines where needed, instead of at sites which are convenient to power sources. Systems can be monitored more effectively by using more sensors distributed across a larger area. Offshore platforms can reduce operating costs by tapping into the nearly-free power of the sun and wind. Cathodic protection to prevent pipeline corrosion is another excellent application for alternative energy.

Traffic Management

As we saw in the example at the beginning of this article, by removing the often daunting requirement of connecting any powered monitoring or notification equipment to the electrical grid, these components can now be located where they are the most beneficial. Traffic counters and dynamic message signs can keep traffic informed of conditions ahead wherever needed, not just in the cities. Adding lighting to a dangerous section of road can be done more quickly and often at lower cost.

Security Systems

Many industrial and commercial operations cover a large area of land. Off-grid lights, sensors and cameras can simplify installation and enhance security in areas that may be neglected if only using line-powered equipment. Now a light, camera, and powered gate can be located in a remote section of a property to provide secure access where needed. Call boxes and motion detectors can be more widely used.

Agriculture

Irrigation water pumping and lighting using solar or wind power can reduce farmers' fuel costs. Because there is usually plenty of land and large roofs available for installing an alternative power system, most farms could easily operate full-time off the grid. The best reason to stay connected could be a solar or wind

power system on a farm will probably have surplus energy which can be sold back to the local power company.

Village Electrification

There are an estimated two billion people living without access to electrical power grids. So, this is an industry with huge growth potential. In developing nations, large scale power generation and grid expansion projects often progress slowly or not at all due to the tremendous costs in both cash and people. Incremental steps using small, simple off-grid solutions can give these communities access to many of the services that most of us would consider necessities.

Water pumping and sewage treatment facilities could make a significant improvement to the quality of life in a remote community. New LED lights that use very little power now make it possible to install low voltage lighting powered by alternative energy sources. Refrigeration, especially in warm climates, is essential for many medicines and foods.

There are a number of organizations developing appliances and systems that can be operated off-grid in small remote communities. Access to electricity and electric-powered conveniences for many of these communities is a big step towards prosperity.

Other Applications

Many applications can benefit from a widespread system of sensors: seismic monitoring, wildfire detection, and creek and river level monitors, to name a few. Temporary power supplies for use during disaster relief are another excellent application. Park management could upgrade facilities without the environmental impact of stringing power lines through a wilderness area, which reduces cost and time.

We've touched on the basics in this article, but hopefully I have given you a few alternatives to consider. Alternative energy supplies and the systems that use them will become more and more common in the coming years. No longer shall we be tied to the grid! The cord is cut and the sky's the limit. ☺

It's a touch panel...

at a text panel price

NEW!
6-Inch Micro Panels



C-more Micro-Graphic panels are packed with features yet still priced for the tightest of budgets. With the addition of the larger 6-inch sizes, you can display even more text, graphics, or bitmaps to effectively communicate and display data to the operator. Two 6-inch models are available (standard or high-contrast background), offering the same base features.

Both units have touch screens and display STN monochrome graphics, however the configurable screen backgrounds let you use color to convey meaning. Mount either unit in portrait or landscape orientation - they function either way!

Protocols supported:

- * All AutomationDirect PLCs
- * Entivity Modbus® RTU
- * Allen-Bradley® DF1 half/full duplex, PLC-5® DF1 and DH485
- * Siemens PPI
- * GE Fanuc 90™ -70 and 90-30 SNPX
- * Omron Host Link and FINS serial
- * Mitsubishi MELSEC®

- **6-inch, 320x240 pixel graphical screen**
- **5 function keys and indicators**
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- **Recipes**
- **Built-in project simulator**
- **Built-in user object/screen libraries**
- **Up to 999 screens** (dependent on screen complexity)

Combine these features and more with the FREE downloadable programming software* and you have a panel that's flexible, cost-effective, and is perfect for a wide array of applications.

* The programming software is free when downloaded from the AutomationDirect Web site, or the CD-ROM package can be purchased for \$25 (part # EA-MG-PGMSW).

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Automation Notebook | Winter 2009 Issue Thirteen

Business Notes

Student Spotlight



The Future of Technology Science/Technology Student Spotlight

Who: Joseph Michael Blakely (Joe)
From: Toledo, OH, USA
Attending College: University of Washington (Seattle, WA)
Major: M. S. in Aeronautics and Astronautics, graduated December 2008



What first got you interested in your area of focus?

I have been deeply fascinated by air and space vehicles for as long as I can remember. When I was a young child, my parents frequently took me to air shows near Toledo, to the local Air National Guard base to watch jets take off and land, and to the Kennedy Space Center to watch space shuttle launches while we vacationed in Florida.

In my early education, math and science were consistently my strongest subjects. I spent much of my free time outside of school taking things apart to figure out how they worked. Long before attending the University of Notre Dame as an undergraduate, I knew that I wanted to be an engineer, and, given my interest in flight, aerospace was definitely the best fit.

What has been the toughest challenge in your higher education?

As one reaches the higher levels of education, motivation to complete work comes less from instructors and professors and more from the individual student. Setting and adhering to personal goals and deadlines in research and schoolwork is challenging, but it instills a sense of responsibility that is hugely beneficial to an aspiring technical student.

What career/job/industry do you hope to be involved in after graduation?

Ideally I would like to work in the aerospace industry on electric propulsion devices for space travel.

What do you think is the most important issue facing the world/our country today, and do you have any opinions on possible solutions?

Human reliance on renewable resources for energy production has long been a controversial subject. It has sparked economic tensions, debates on global responsibility, and even war. In time, nuclear fusion will likely provide a cheap, clean, and safe alternative to fossil fuels. Seawater, the most abundant substance on the planet, would provide the primary fuel source. Also, with proper material choices, most radioactive waste would have a significantly lower half-life than from fission reactors.

Describe how the idea for your application of AutomationDirect products came about:



Previously, manual operation of the ZaP Flow Z-Pinch Experiment was the only method of operation. This method was fairly operator-intensive and was open to both variability between pulses and the possibility of human error.

Designing and implementing an automated operation system had long been a goal of the project, and **DirectLOGIC** PLCs proved a user-friendly, cost-effective solution.

Applying AutomationDirect Products

I did my thesis work in the ZaP Flow Z-Pinch Lab at the University of Washington:
(<http://www.ua.washington.edu/AERP/ZaP/>).

The ZaP Flow Z-Pinch Experiment is a basic plasma physics experiment which investigates the effects of sheared flow on the stability of magnetically confined plasma in a Z-pinch configuration. Possible applications of this technology include use as a controlled fusion device for energy production, a fusion thruster for space propulsion, or an extreme ultraviolet light source for lithography in integrated circuit manufacturing.

Previously, creating a single plasma pulse required one or more operators to initialize all applicable measurement instruments, monitor and control the vacuum system, control the charging of the experiment's capacitor banks, manually trigger the experiment at the desired capacitor bank charge, and store all acquired data. I installed, wired, and programmed a PLC to automate the entire sequence for creating each plasma pulse.

The PLC controls the vacuum system, charges the capacitor banks, and triggers the experiment. A graphical user interface allows an operator to initialize and monitor the status of the PLC and the experiment. The GUI also calls the data acquisition, storage, and analysis programs automatically for each plasma pulse.

Tech Brief

Electrical Standards



NEMA or IEC Standards?

By Brian S. Elliott

Those of us who have worked professionally in the U.S. electrical control industries have a good understanding of, and a certain level of comfort with, NEMA standards; most notably as they pertain to electric motors, motor controllers and enclosures. For the most part, American-based companies require that the electrical components and enclosures used in any given project adhere to NEMA standards. As such, any electrical engineer or designer working in the U.S. is well advised to develop a working familiarity with these codes.

NEMA (National Electrical Manufacturers Association) is principally responsible for developing and publishing all of the standards in the U.S. that dictate the configuration and performance parameters of electrical components used in power generation, transmission, distribution, control and end use. Considering the size and scope of the industry, this can only be described as a daunting responsibility and one that NEMA has carried out with distinction since their formation in 1926.

Over the years it has become obvious that a second standard, IEC, has encroached on the U.S. market. This standard covers the same basic categories as NEMA codes, except that they are more commonly focused on the European and Asian markets. With the electrical control industry's clear trend towards globalization, many electrical engineers and designers find themselves tasked with projects that require all specified components conform to IEC standards. For this reason, and others, it

is imperative that contemporary engineering personnel have a familiarity with these standards. This holds true with maintenance and service personnel as well. Much of the production equipment used in the U.S. is now manufactured overseas and uses electrical controls that have been designed to IEC standards.

IEC (International Electrotechnical Commission) develops and publishes standards for the European electrical communities. IEC was formed in 1906 and remained primarily European-based until well after WWII. During the past few decades, however, IEC-based electrical components have been offered and are now being used by a growing number of companies throughout the US and North America.

From a practical standpoint, the principal differences between components manufactured against these two standards are negligible. NEMA components are generally considered more robust and, therefore, provide better long term performance in the harsh environments that some manufacturing plants present.

IEC components are usually smaller and allow better packing densities, which can be a real advantage when working with today's compact machine designs.

When working with American manufacturing facilities, NEMA standards are still king. This holds true with American manufactured equipment as well. Many plants throughout North America will have blanket requirements that the electrical components used on all new and existing equipment conform to NEMA standards. This is done primarily because engineering, maintenance and service departments do not want to confuse their systems with dual standards. Unfortunately, this precludes IEC-based equipment and proposals from even being considered in the bidding processes.

I have found that the knowledge most professionals have about both standards is not necessarily from the documents themselves. In my humble opinion, the reason for this situation is the relative inaccessibility of the

standards. Both organizations' extensive Web sites are very confusing to navigate. (NEMA's web address is: www.nema.org and IEC's is: www.iec.ch.) Finding a standard on either Web site appropriate for your specific application is almost impossible, unless, out of frustration, you make a phone call and ask for assistance. Then, you're informed that you have to purchase the standard before you can actually be sure if it's the one you need. If it's not, you have to start all over again.

I live near a large engineering school whose library maintains a standards room. On occasion, when I need to review a standard, I simply drop by the library and spend some quiet time reading and making notes. This also provides me with the ability to review a standard before purchasing it, on behalf of my customer.

NEMA or IEC, that's a question that doesn't seem to have an obvious answer. It's clear that components manufactured to either standard produce electrical controls with excellent long-term performance, reasonable purchase prices and good availability. They both have their pros and cons, and will co-exist for a long time to come.

Brian Elliott Bio



Brian Elliott is currently V.P. of Engineering and Manufacturing at Air Options, Inc. During the course of his long career, he has worked in various industrial, technical and scientific fields ranging from automated manufacturing to high energy physics. He has authored two books, "The Compressed Air Operations Manual" (ISBN 0-07-147526-5) and "Electromechanical Devices and Components" (ISBN-10 0-07-147752-7), both are published by the McGraw-Hill Book Company. Both books are available through book retailers worldwide.



FYI

FAQs

CLICK™ PLC FAQs

by Jeff Payne
AutomationDirect
PLC Product Manager

Will the CLICK PLC work with my C-more and C-more Micro graphics panels?

Yes. Currently the CLICK PLC driver is available in the **C-more** Micro panel with firmware version 0201001 or later, so native CLICK addresses are available.

The CLICK PLC driver for **C-more** touch panels is currently under development and scheduled to be available soon. You can communicate between the CLICK PLC and **C-more** touch panels with the standard MODBUS RTU protocol.

Where can I find the corresponding MODBUS address for the CLICK PLC registers?

The CLICK PLC Address Picker has an option to "Display MODBUS Address". When this is selected you will see a column between the Data Type and Nickname with the title "MODBUS Address (Function code)". This lists the actual MODBUS address for the corresponding CLICK address on that row. You also have a list of valid MODBUS function codes for that data type represented in parentheses, such as (03, 06, 16).

You also have two display options based on the type of MODBUS device you are using. You can display the MODBUS address as a 984 address or HEX address, for example:

DS27 400027 (984)
DS27 001A (HEX)

Do I have to use the mouse or can I use the keyboard when inserting an instruction into ladder logic?

You have three options for entering instructions into the ladder logic.

With the mouse:

- you can single click and drag from the instruction list into the ladder.
- you can double click from the instruction list and populate at the current cursor position.
- you can type the instruction

abbreviation directly into the ladder at the cursor position.

There is an auto complete feature, so when there are no other possible combinations it will display the instruction dialog box.

Instruction keyboard shortcuts include:

NO (F2)	Normally Open
Ctrl+F2	Immediate
NC (F3)	Normally Closed
Ctrl+F3	Immediate
Shift+F2	Raising Edge
Shift+F3	Falling Edge
=, !, <, >	Compare Contact
OUT	Out coil
SET	Set coil
RESET	Reset coil
TMR	Timer
CNT	Counter
MATH	Math
DRUM	Drum
SR	Shift Register
COPY	Copy Data
SRCH	Search
CALL	Call Sub-routine
FOR	For loop
NEXT	Next instruction
END	End instruction
RD	Network Read
SD	Network Send

You can also type certain data addresses directly. For a normally open contact, you can type any address for an input (X001), output (Y001), internal contact (C1), Timer (T1) or Counter (CT1). For a coil, you can type any address for an output (Y001).

How do I draw a branch circuit on a rung?

You can enable the line drawing tool from the Menu structure Edit > Line or click the icon. There is also an Edit > Erase Line tool or click .

You can also use keyboard shortcut keys for drawing lines in the ladder logic. To draw a line use Ctrl+arrow keys so the line draws in the direction of the arrow key you press. Ctrl+Shift+arrow key will erase lines (rungs or branches)

Is there a power budget requirement with the CLICK PLC?

Yes and no, depending upon the power supply you are using to power your system.

If using the C0-01AC CLICK

power supply there are no power budget concerns. The 1.3 amps supplied more than adequately handles any possible I/O module configuration. But, if you are using the C0-00AC CLICK power supply there are power budget considerations. The 0.5 amps supplied is not adequate to handle all possible I/O module configurations but may be suitable for many.

If you are using a different manufacturer's supply or a system power supply, calculate your budget carefully. The System Configuration Setup window in the CLICK PLC software will calculate the power budget for you, either online or offline.

There is also a system configuration tool at www.clickplcs.com/config that will calculate the power budget, I/O count and price.

Can DirectSOFT or DNLoader be used with the CLICK PLCs?

No. CLICK uses its own programming software package and neither **DirectSOFT** nor **DNLoader** will work with CLICK.

Does CLICK support local expansion or remote I/O?

No. CLICK PLC is limited to 8 I/O modules for each CPU.

"I have found the best way to give advice to your children is to find out what they want and then advise them to do it."

– Harry S Truman (1884 - 1972)

"Happiness isn't something you experience; it's something you remember."

– Oscar Levant (1906 - 1972)

User Solutions

Pyromatics & winddaddy

DL06 PLC puts heaters to the test

By Tom Brickey & Mike Sabatine
Pyromatics Automation Systems
www.pyromaticslc.com

Pyromatics Automation Systems of Crystal Lake, IL, was contracted by Durex Industries of Cary, IL, to develop a Life Cycle Test Station for its electric heating elements. After extensive research, Pyromatics chose AutomationDirect as the primary supplier of hardware and software for the project.



This test station needed a user-friendly graphical interface to give operators the ability to select multiple ramp/soak parameters, output voltages, temperature sensor types, amperage ratings and total cycle counts on tests for the cast-in electric heater platens. The system also needed to record temperature, volts, and current draw throughout the test for use in quality reports.

Most important, a failure of the heater being tested required a safe shutdown of the test while alerting the quality department of the alarm condition. If a heater is drawing either too much or too little current, or if the tem-

perature difference between the primary and secondary temperature sensor is too large, the system would stop the ramp/soak cycle and turn off the output to the heater.

Pyromatics selected the cost-effective **DirectLOGIC**® DL06 PLC as the heart of the system because of its ability to control up to eight PID loops and multiple expansion slots available for thermocouple cards and analog input modules. It also provided the necessary discrete inputs and outputs to control two heaters, two chillers and an array of panel indicators, buttons, switches and relays. Programming the DL06 was a snap, using the

DirectSOFT® Ladder Logic Editor.

The **C-more** EA7-T10C 10-inch TFT touch-screen operator interface was used to provide operators with the necessary interface to operate and monitor the tests.

The challenges of building the control panel were eased with the use of DIN-rail mounted hardware, including the DL06 PLC, terminal blocks, solid state relays, power supply and other components. Wire routing was simplified using T1E Series thin finger wire duct, giving the finished panel a professional look.

The completed system allows users to quickly connect the heater to be tested, enter test parameters, and run the test. Trend charts on the **C-more** panel provide excellent tools for tracking test parameters and quickly identifying potential issues such as sudden drops in current or temperature.

Alarm reporting and history are also automatically recorded, allowing the operator to determine causes of failure. Data from the test can be easily uploaded to a USB thumb drive from the **C-more** panel. The data can then be imported into the user's choice of word processor or spreadsheet.

Once the test station was built and delivered, requests for additional analog input requirements were easily met with



the extra expansion slots available on the DL06 PLC. Another post-delivery enhancement was the addition of e-mail alerts, sent from the **C-more** panel to notify personnel of failures and other events. A duplicate system was built to meet the increasing demand for customer-specified life cycle testing.

Future enhancements of the test stations will include post-cycle quality metrics, such as AC hipot testing, which will verify sufficient insulation of the components to protect operators from electrical shock. AC leakage and heater resistance measurements will also be added.

AutomationDirect provided superior sales and service support throughout the project. Phone and email support and online manuals with detailed example connectivity diagrams and ladder logic samples made any programming challenges achievable.

Both systems have been running on a continuous basis for the past year and have completed full accelerated life testing on over 100 heaters. This testing has allowed Durex to design heaters that meet or exceed their customers' requirements.

Ohio Energy Group Finds Alternative Control

By John Decker

I am a member of a small alternative energy group in Ohio. Many of us generate our own power using wind turbines. These wind turbines vary widely from low power to high power and from homemade to high-tech. Among all of this diversity, we had one common problem - we were looking for a new solution to replacing our aging analog wind turbine controls. Not only were the old controls becoming a reliability issue, but replacement parts were becoming more difficult to get, and they were also more expensive. To

compound these issues, the local power company had also informed us of impending tighter restrictions regarding safety systems and power distortion (THD) control that our simple analog control systems could not handle for our induction generators.

It became apparent that we had to find a system that could be easily customized to work with a variety of wind turbines and control schemes. With a large investment already made in the turbines and towers, we had to find an upgrade path that was affordable. This seemed simple enough, or so we thought.

After several months of research, we noticed a definite pattern. Available control systems were either way too expensive for the average person, or were proprietary and purpose-built for a specific wind turbine. There was nothing available that met the needs of our installations and budget, let alone a solution that could be adapted to various setups. We began to feel that searching for a new control system was a lost cause.

Then, I ran across the AutomationDirect Web site while looking for a new supplier for some relays that we used in our control system. The **DirectLOGIC**® PLCs and the **C-more** Micro panels really caught my eye. Could components this inexpensive really be used to design a replacement control system? I did some research online and I was very impressed with the many rave reviews I found regarding AutomationDirect and their great support. After bringing my findings to some of the others in our group, I was met with a lot of skepticism, but I got their backing to engineer our own control system, and use these affordable components that I had just found from AutomationDirect.

The next problem was finding someone with PLC experience to help us design our new system. Hiring a PLC programmer sounded like a great idea until we got some price quotes. After a few more dead ends, I finally decided I

would learn to program in relay ladder logic (RLL) and attempt to design the control program myself. Having done minor computer programming in the past, I felt confident I could give it a try.

I placed an order and purchased enough components to make four complete units. I chose the **DirectLOGIC** D0-05DR PLC and the 3" **C-more** Micro panel as the main components. Since we also needed new instruments to measure alternator RPM and wind speed, I ordered HO-CTRIO high speed counter cards and found some suitable pulsing instruments. In fact, every component we used, except for a couple of sensors, was ordered from AutomationDirect.



While the DL05 and the **C-more** Micro together were the most expensive components, the combined cost was still much less than some of the individual modules in the old control system.

Maintenance and repair time regarding the PLC also had many advantages. For example, if the new control system became damaged from a lightning strike, it would be easier and less expensive to replace a \$99 PLC than to replace several modules priced anywhere from \$300-\$500 each with the old system. Everything about this approach made a lot of sense.

I took a few weeks to read through the manuals and study up on RLL

Continued, p. 26>>

User Solutions

winddaddy cont.

Continued from, p. 25



programming and *DirectLOGIC's* RLL Plus. I found the RLL Plus stage concept so easy to understand and the manual so well written, that I drew out the state logic to the entire control program immediately after reading the chapter that very day. I became very interested in PLC programming at that point and joined AutomationDirect's online technical forums. I was pleasantly surprised with how welcoming and helpful the community there was. It allowed to me ask questions, get answers and share my experiences very easily.

Over the next couple of weeks, I worked on turning my state transition diagrams into RLL code. I am still amazed at how easy it was. Even when I was stumped, the online community was right there to help. Early on in the programming process, I realized that I had a lot of unused inputs and outputs, so I switched strategies and became determined to make each of our PLC-

based control systems control two wind turbines. If this worked, it would cut costs per wind turbine in half for many installations.

After about three weeks, I had a very workable prototype. Keep in mind that I had never even seen or heard of RLL just a month prior to this! I took some time to do some bench-top testing. In my case, bench-top testing actually took place on my kitchen table. I don't have a development lab – I am just an average guy that took an opportunity to try something new. After a week or so of testing everything I could think of, I took some time to find bottlenecks in the code, clean up the user interface, and add some “bells and whistles,” such as trending, test screens, and engineer-

ing screens that we couldn't even find in the most expensive control systems we had priced earlier.

Just a couple of short months after starting the project, we were installing the first unit on a pair of 40 KW wind turbines. Representatives from the electric company were there to run their battery of tests. We were all blown away when our new unit outperformed all of our old control systems by an enormous margin, and even met all requirements of the stricter regulations that were going to be instated in the future. The total cost of the new units came out to be less than half of the cost of our older analog controls, and it performed much better. Before we knew it, we had a total of seven wind turbines running off of the four original prototype units. There is still a lot of talk about how much better and more efficiently these new units perform!

Recently I was approached by a

company that builds and installs wind turbines. They explained that they had been looking for just this sort of control system for their business. Shortly thereafter, I signed a contract with them; our creation, the “Winddaddy 213” will be used on all of their new installs, and they will offer it as an upgrade to their existing customers. This encompasses over 70 wind turbines! Their first orders have already been placed and units delivered. They are also talking about sponsoring me to design an upgraded version that will control even more turbines simultaneously and offer even more advanced features.

Looking back at this experience and looking at the finished product, I am still amazed at how this all unfolded. What started out as a basic need for us, turned into something much bigger. I now have a control system I understand fully. I can make changes and improvements as needed. I feel empowered that we don't have to wait on a supplier or manufacturer when we need parts. We know how it operates and we know how to fix things should something go wrong. I would encourage anyone facing a similar situation to take the same road we did. We have gained so much from this experience and still can't find a single negative to our decision.

“Political advertising ought to be stopped. It's the only really dishonest kind of advertising that's left.”

– David M. Ogilvy

“A celebrity is a person who works hard all his life to become well known, then wears dark glasses to avoid being recognized.”

– Fred Allen (1894 - 1956)

“If a cluttered desk is the sign of a cluttered mind, what is the significance of a clean desk?”

– Laurence J. Peter (1919 - 1988)

Automation Talk

webinars

Taking Web seminars to the next level

By Shane Crider
AutomationDirect,
Digital A/V Media Specialist

After the economic decline at the beginning of this decade, many companies started looking for ways to cut costs. One such expense was travel – whether sales or training, needs were evaluated and budgets were cut.

During this time, many new ways of online training emerged – one being Web-based seminars. Many companies found that hosting weekly Web seminars ranging from 30 to 90 minutes was very effective for their clients and customers.

Here at AutomationDirect we don't offer a direct sales force that continuously beats on doors trying to sell products, take customers to lunch and promise everything under the moon. We have always offered a different way of doing business by offering products directly to our customers, and by doing so, we are able to keep prices low.

Nearly six years ago, we looked into the idea of Web seminars that would offer our customers a new way of learning and still fit into our “way of doing business”.

At the beginning of the Web seminar era, the only option to host an event was to sign a contract with a hosting company. AutomationDirect tested many companies and found one that worked.

A few years later we moved on and selected another hosting company that offered better service and lower rates. Then another few years later – well, you get the idea. If you were going to host Web seminars, you were most likely going to sign a contract and be limited to whatever tools the “host” offered, not necessarily what you wanted.

At the time of the Web seminar push, streaming video was not yet incor-

porated and still today, some hosting companies don't have a good tool for streaming video in a Web seminar.

This was an option we always wanted here at AutomationDirect. All our previous formats required the end users – our customers -- to log in through their computer to watch slides and software demos, and listen to the audio separately over the phone. It worked great, but posed a problem for some if they only had a cell phone.

Why couldn't we incorporate the audio over the Internet? After years of changing hosting companies, some of them being bought out by others and forcing us to change our formats, we finally said, “Enough!”

At the time, we were also looking for a system that would allow us to broadcast live audio and video of our weekly company meetings from our main auditorium to our surrounding buildings and home-based employees. Through research, we found this to be expensive and complicated, but it could be done.

In April 2007, a co-worker and I packed our bags and headed out to Las Vegas for the annual NAB (National Association of Broadcasters) tradeshow. We were in search of better ways to record videos for our customers and company, as well as searching for a solution to our desire to broadcast live.

If you have an interest in any type of audio/video and its equipment, NAB is the place to go. There, you can spend four days walking the trade show floor, talking to vendors about anything and everything related to A/V, plus attend a full week of training classes.

We stumbled across a couple of vendors who offered possible solutions, and to our surprise, one of them had exactly what we wanted. We purchased some hardware and the associated software from a company called Vbrick Systems, Inc. and tested it extensively here at our campus.

After purchasing a video switcher and a few monitors, we were up and running like a television talk show.

The system allows us to send a PowerPoint presentation to the end user as well as audio and video all packaged together. This was a perfect fit for our company meetings.

After weeks of testing, we decided it would be the perfect fit for our customers who desired Web seminars.

Soon, a second Vbrick was delivered. We quickly re-arranged the studio, set up some additional equipment and voila! We have a full in-house studio for hosting live Web seminars right here at AutomationDirect.

You would think that equipment like this would cost far more than the return, but we were able to set up our new studio and outfit it for the cost of what we were paying for a few months of hosting services. In the end, it saved us money which allows us to keep our cost down and pass the savings to you, the customers.

Now that we had the equipment and knowledge, we had to get to work on the program's new look and feel and meet the demands of our customers. We created a new Web site called “AutomationTalk” since that will be the main topic: talking about automation products.

I really don't like to call them Webinars – I feel we have a different look and feel. We offer something different than the traditional “webinar.” I like to refer to them as our “talk shows”.

Automation Talk is currently running and we offer bi-weekly topics in a live show format, where our customers see our products as we talk about them. If you are too busy to watch our scheduled shows, you can log in and watch any of the previous shows in a recorded format.

It has taken several months to get the project up and rolling, and we are excited to finally offer this revitalized service. Some of our presenters had been a little shaky on camera but they are slowly defeating the stage fright and now feel like talk show stars.

We encourage you to stop by the

Continued, p. 30>>

Tech Review

operator interface compatibility, part two

C-more HMI with Enhanced Allen-Bradley PLC Driver Support, Part Two

By Greg Philbrook
HMI and Communications Product Manager,
AutomationDirect

No mapping or translation is required. For the complete discussion (covering Parts One and Two, go to <http://support.automationdirect.com> and select the link to Technical and Application notes. Select the *C-more* link and download document AN-EA-004 (Using *C-more* HMI with A-B PLCs).

Then change the "Save as type" to L5K (Figure 3). Remember which folder you selected when saving the file since you will need to find it later with the *C-more* programming software.

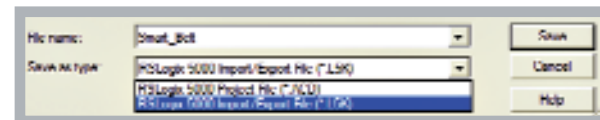


Figure 3

C-more® Allen-Bradley® Support	DF1 Full Duplex	DF1 Half Duplex	DH485	Generic EtherNet/IP Server (I/O Messaging)	EtherNet/IP Client	EtherNet/IP Tag-Based Client	Tag-Based DF1 Full Duplex	Tag-Based DF1 Half Duplex
SLC™ 5/01, 5/02			Yes					
SLC™ 5/03	Yes	Yes	Yes		Yes ^{1,3}			
SLC™ 5/04	Yes	Yes	Yes ²		Yes ^{1,3}			
SLC™ 5/05 (Series A 05501 FRN5 & Higher)	Yes	Yes	Yes ²		Yes ¹			
MicroLogix™ 1000, 1200, 1500	Yes	Yes	Yes ²		Yes ^{1,3}			
MicroLogix™ 1100	Yes	Yes	Yes ²		Yes ¹			
PLC-5	Yes							
ControlLogix®				Yes ¹		Yes	Yes	Yes
CompactLogix®				Yes ¹		Yes	Yes	Yes
FlexLogix				Yes ¹		Yes	Yes	Yes

1 Ethernet available on full featured C-more™ panels only. -R units do not support Ethernet
2 AIC module from Allen-Bradley® required for this connection
3 NET-ENI module from Allen-Bradley® required for this connection

Figure 1

In part one of this two-part article, we discussed the types of Allen-Bradley PLCs that are supported by the AutomationDirect *C-more* HMI and covered in detail which protocol should be selected for your application. We also covered the various Data Types for Tags that are supported.

This latest group of drivers supports the A-B family of PLCs; the new Ethernet drivers allow simple connectivity of multiple *C-more* panels and/or multiple A-B PLCs (Figure 1).

C-more also has ControlLogix Ethernet/IP Tag Messaging support. This feature increases productivity by reducing the time required to map your PLC tag database into the HMI. You can import the RSLogix 5000 L5K file directly, or with just a few clicks of the mouse you can directly enter your ControlLogix or CompactLogix tags from the PLC into a *C-more* database.

The *C-more* programming software supports the import of tag database files that are stored in a tabular format, also known as a ".csv" file type. For a detailed example, we will discuss importing from an existing L5K file which is created with the RSLogix 5000 programming software.

Porting Logix Tags into C-more programming software

The RSLogix 5000 software allows users to create an export file that contains the Tag database information.

Within RSLogix 5000 and with your project file open, Select **File > Save As** (Figure 2).

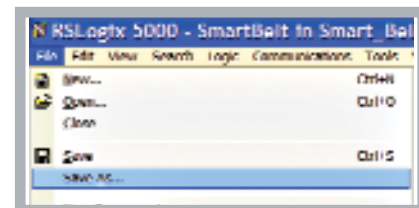


Figure 2

Now that you have the L5K File saved, open the *C-more* Programming Software and select **Import > Tag Name Database** (Figure 4).

This will open a window that will display options for importing the tag

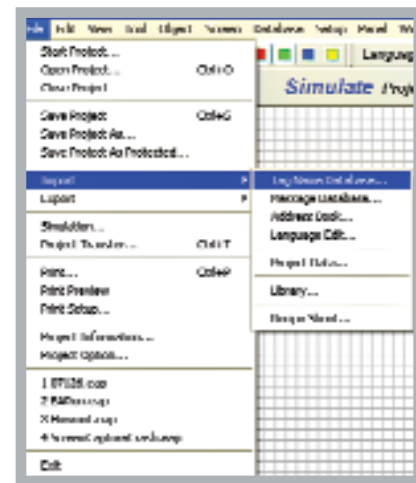


Figure 4

database files. To Import an L5K Tag Database into *C-more* Programming, select **Import > Tag Database > Select L5K File**.

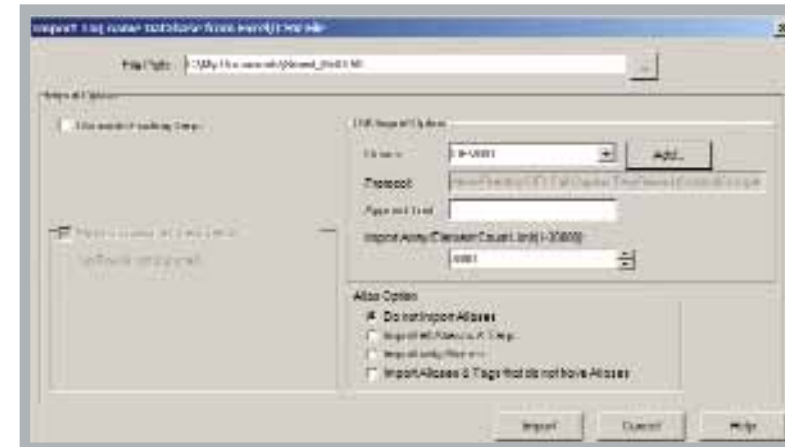


Figure 5

Importing Predefined data types

There are many Predefined data types in the A-B ControlLogix and CompactLogix PLCs. A Predefined data type is one that is already created in the RS Logix 5000 software when starting a new project. Some common Predefined data types are TIMER and COUNTER. The complication in importing Predefined data types is that there are many of these data types in the RSLogix 5000 software and within many of those, there are multiple data type members. Many members of these Predefined data types, while useful in the PLC application, will not be needed in the *C-more* project. So, the issue is to decide which Predefined data types should be imported and which members of those types should or shouldn't be imported.

Optimizing communications between C-more and A-B PLCs

In most situations, specific actions to optimize the communications between *C-more* and the PLC are not necessary. In a large application where performance is crucial, it may require more careful planning when designing the system. The following guidelines can be used to optimize communications with most types of HMI brands connected to a PLC. However, when

using a *C-more* HMI connected to a PLC, some detailed knowledge of how and when communications are initiated is necessary.

Writing Data to the PLC

C-more writes data to the PLC infrequently in most applications.

Screen objects only write to the PLC when triggered by the user, such as when a Pushbutton object is pressed or released, the Enter key is pressed in a Numeric Entry object, the Slider object is moved, etc.

The second way that *C-more* will issue a Write action to the PLC is through the Event Manager's "Tag Copy" function. This can be triggered by a tag changing values, a screen change or time schedule. (See the Event Manager functions for more details.)

The third way that *C-more* will write to the PLC is through the Panel To PLC tags. These typically only occur on a value change and happen infrequently most of the time.

Writes occur rarely enough in most cases and typically do not need to be considered when trying to optimize communications.

Reading Data from the PLC

There are several functions which cause *C-more* to issue read requests to the PLC.

The most common are the objects on the current screen that is being displayed. The only objects that will issue read requests, regardless of the

screen being displayed, are the trend objects. Most of the time, optimizing the PLC addresses assigned to objects on the same screen will have the most impact on performance.

Additional HMI functions that will issue Read requests are alarm events and tag events. Any event created with a tag object addressed to the PLC will constantly read from the PLC no matter which screen is being displayed. Careful planning of the addresses used in events will greatly increase communications performance as well.

The PLC to Panel tags will also be read constantly regardless of which screen is being displayed. Logical PLC addressing of these tags should also be considered.

Optimization for non-Tag based PLCs (SLC and MicroLogix)

The SLC and MicroLogix PLCs are fixed addressed PLCs. Grouping consecutive addresses of the same data type in the same file without significant gaps between the addresses is the only way to optimize communications for these PLCs. Grouping tags of consecutive addresses on the same screen, in the event manager or in the PLC to Panel screen will reduce the number of requested packets and will therefore increase the frequency of updates to the visible objects.

Optimization for Tag based PLCs (Control/Compact/FlexLogix PLCs)

The Control/Compact and FlexLogix PLCs are tag based PLCs. The method of communications (both serial and Ethernet) involves including the actual symbolic tag name in the request sent over the wire. This means the tag names themselves affect the speed of communications by creating larger and/or multiple requests to the PLC. Program space tag names are not efficient; each tag name needs the PROGRAM: header as well as the name of the program in front of the tag name.

This scheme makes the size of the request much larger, requiring more requests to get multiple tags.

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Tech Review

PART TWO CONT.

Continued from, p. 29

Controller scope tags are globally accessible and do not require the header information, thus making the size of the request much smaller and more efficient. Controller Scope tags should be used as much as possible when performance optimization is an issue.

Another method to reduce the size of the tag name requested without necessarily compromising the descriptive nature of the name is to use an Alias name in the *C-more* software. The alias name could be much shorter than the original tag name in the PLC.

The most effective method to reduce the number of requests from *C-more* to the PLC is to use arrays in the PLC and then assign the *C-more* tags to consecutive elements in the PLC array. *C-more* can then request multiple PLC tags with one request. This method will, by far, have the most impact in enhanced communication performance between *C-more* and the PLC.

Conclusion

This concludes the two-part series on using *C-more* with the A-B drivers. For the complete discussion (covering Parts One and Two), go to <http://support.automationdirect.com> and select the link to Technical and Application notes. Select the *C-more* link and download document AN-EA-004 (Using *C-more* HMI with A-B PLCs).

Automation Talk

webinars cont.

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site at: www.automationtalk.com and watch one or many of our shows. These are filled with current and new products that we offer at AutomationDirect. We also have a video learning site that is filled with video tutorials on how to effectively use our products – it can be found at:

<http://learn.automationdirect.com>.

As always, we strive to meet the demands of our customers and we try to stay ahead of the curve. I am sure we will improve on this system in the future, as Internet audio and video improve. Can you imagine sitting at your desk watching a Web-based seminar in HD while listening to it in surround sound?

We hope to see you soon.

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Automation Notebook | Winter 2009 Issue Thirteen

The Break Room

Humorous stories & BrainTeasers



Doc, It Hurts When I Do This...

By Justin Stegall

Art Director & Automation Notebook Design Manager,
AutomationDirect

Recently, my co-worker and I went to lunch at our favorite local wing and burger dive. This "restaurant" is the sort of place that is not at all concerned with health rating standards and employees seem to pride themselves on the sticky tables and floors.

We enjoyed our typical artery-clogging fare, a greasy burger with French-fries, and were about to settle the bill when my co-worker began to have a violent coughing fit (probably a result of some soft drink down the windpipe). Concerned about him, I quickly checked to make sure he was okay.

Convinced the Heimlich maneuver was unnecessary (mouth-to-mouth was out of the question) I left him alone since he did not attempt to display the universal choking sign and eventually, with teary-eyes, assured me he was all right. We paid our bill and headed back to the office.

Later that day, I asked him how he was feeling. He replied that he did not feel well at all and that his chest and lungs hurt. I attempted to offer some reassurance that he was okay by suggesting it was probably just a muscle pull from his earlier coughing fit.

The following day he arrived to work a little later than usual, stating that he had been to the doctor because of his chest pains. Naturally, I was concerned and anxious to hear about the results of his visit, especially considering our shared un-healthy diet and non-active lifestyles.

In a tone that could have been mistaken for concern, my co-worker reported on the doctors findings. Complete x-rays, a total blood workup and numerous other tests all confirmed there was nothing seriously wrong with him. A routine set of follow up questions included, "Have you participated in any unusual physical activity within the past several days?"

A moment of brief thought later, he remembered the unusual physical activity he had participated in two days prior.

The embarrassing realization he came to caused him to chuckle aloud (reminding him of the pain in his chest). Two days earlier Santa had sleighed in a Nintendo® Wii™ for his two boys. In an effort to test the product for quality and reliability, my co-worker boxed his sons on the Wii for several hours.

If the greatest game of your childhood involved watching two paddles return a ball back and forth on a black screen then maybe you should heed the warnings of the Wii and read the 16 pages of safety information included in the manual. Video games are cool and appeal to the child in us, but can be addictive and cause embarrassing injuries.

BrainTeasers

1.) Think Tank

If the area of the floor of a tank is six square feet, and the tank contains 9 inches of water, how much does the water level rise if a 1 foot cube is placed in the tank? How much farther would it rise if another identical cube is added?

2.) Close Proximity

An automation vendor has been packaging their proximity sensors in boxes of 160 sensors for years. These small cylindrical parts are typically stacked in 8 rows of 20 sensors each to perfectly fill the boxes. With sales increasing, and production ramping up, the vendor realizes that it may be possible to increase the number of sensors in each box, without changing the box size. How do they do it, and how many more sensors will fit in each box?

3.) What's Wrong Here?

Can You Spot All the NEC Code Violations?



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10' Motor Feedback Cable	\$49.00 SVC-EFL-010		\$141.00 2090-UXNFBY-S03
10' Motor Power Cable	\$29.00 SVC-PFL-010		\$82.00 2090-XXNPFY-16S03
Configuration Software	FREE SV-PRO*		\$75.00 2098-UWCPRG
Complete 1-axis 100W System	\$965.00		\$2,293.00

*SureServo Pro software is FREE when downloaded and is also available for \$9 on a CD.

All prices are U.S. list prices. AutomationDirect prices are October 2008 prices. The Allen-Bradley 100W system consists of part numbers shown in table above with prices from <http://shop.rockwellautomation.com> 9/29/08.

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