

Automation NOTEBOOK

Your guide to practical products, technologies and applications

MANUFACTURING WANTS YOU

AS VETERANS LEAVE THE MILITARY,
MANUFACTURERS ARE RECRUITING
FOR THEIR SKILLS.

PG. 10



C-MORE TOUCH SCREEN INTERFACE PANELS

NEW HARDWARE FEATURES ADDED

PG. 4

URBANEDEN

"PEOPLE'S CHOICE" FOR
A COST-EFFECTIVE AND
ENERGY-EFFICIENT
SOLAR POWERED HOME

PG. 24

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Summer 2014 | Issue 29



DC drives for efficient control

DC motors and drives provide several advantages over AC-powered devices. Our new Ironhorse DC drives are suitable for many control applications, all at prices that won't break your budget.

- Inexpensive – DC drives are typically less expensive than AC drives
- Low speed performance – DC drives and motors provide excellent low speed control and stability
- Low speed power – DC motors provide exceptional low speed torque and power
- Simple – our DC drives are typically configured with potentiometers – no parameters or programming needed



GSD1 Series starting at: \$115

High-performance Pulse-Width-Modulated (PWM) controllers for 12 to 36 volt battery/solar-powered equipment - up to 1/2 HP

- Low Voltage PWM
- 12/24/36VDC input
- Up to 20A output current



GSD1-12-10C



GSD1-12-10N4X

GSD4 Series starting at: \$65

Cost efficient, reliable SCR control for permanent magnet, shunt wound, and universal motors - up to 2 HP

- Economical, general purpose
- 24/36VAC, 120/240VAC input
- Up to 10A output current



GSD4-240-10N4X



GSD4-240-1C

GSD6 Series starting at: \$330

Most fully-featured IronHorse analog SCR drive with features not typically found in drives in this price range - up to 3 HP

- Advanced features offer flexibility
- 120/240VAC input
- Up to 15A output current



GSD6-240-15C

GSD3 Series starting at: \$59

Compact, economical variable speed SCR controllers for small DC and universal motor applications - up to 2/3 HP

- Small, compact
- 12/24VAC, 120/240VAC input
- Up to 2A output current



GSD3-240-2CJ



GSD3-240-3N4

GSD5 Series starting at: \$135

General purpose SCR drives rated to 2 HP

- General purpose, many enclosed options
- 120/240VAC input
- Up to 10A output current



GSD5-240-10C



GSD5-240-10N4

GSD7 Series starting at: \$160

Instant reversing, quick stopping & rapid cycling SCR drive utilizing unique zero-speed detect and dynamic braking circuits - up to 2 HP

- Reversing
- 120 or 240VAC input
- Up to 10A output current



GSD7-120-10CR30



GSD7-120-1CR3

Also check out our AC and DC motors.

Order Today, Ships Today!



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Automation NOTEBOOK

Your guide to practical products, technologies and applications

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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

Dependable: *adj. capable of being depended on; worthy of trust; reliable: a dependable person.*

According to the dictionary, dependable is an adjective. I consider it to be more like a verb. In order for one to be capable of being depended on, one must do things to show that others can depend on and trust that person.

Say your neighbor needs someone to watch his house while out of town. He knows he can count on you to protect his belongings, pets, cars, etc. from harm during his absence, because you have helped him numerous times before. He knows he can trust you, therefore he considers you dependable. By your actions, you have shown your dependability.

That's what we do at AutomationDirect; we show dependability not only in the thousands of quality products we offer, but also in the service and support we give for those products. We continue to show our dependability through other means as well, such as our Web sites, our e-newsletters, and here in Automation NOTEBOOK.

In Issue 29, we provide you with several informative articles with information regarding our Do-more Designer programming software, we answer questions about our newest C-more touch screen interface panels, and give you a taste of other new products. Also in this issue, I have written our cover story on the topic of American manufacturing and how it can assist and benefit from members of our U.S. armed Forces returning to the civilian work force. Scott Martin has provided us with a great User Solutions article detailing how KCC Software transformed a 175-ton hydraulic forming press.

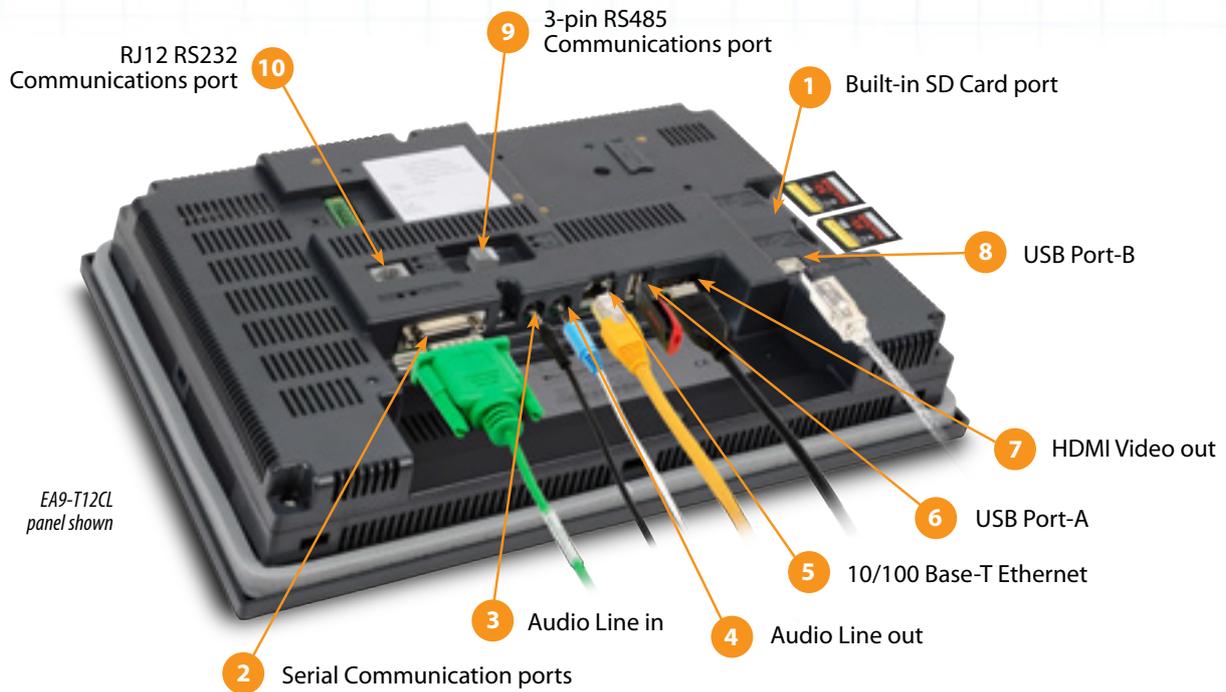
Chip has once again given us a set of his awesome Brainteasers in The Break Room. See if you can solve them. Then check your answers online at:

www.automationnotebook.com



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AUTOMATIONDIRECT ADDS HARDWARE FEATURES WITH NEW SERIES OF C-MORE TOUCH SCREEN INTERFACE PANELS



AutomationDirect has released its new EA9 series operator touch panels for the C-more line. The color TFT touch screens are available in 6, 8, 10, 12 and 15-inch versions. Loaded with new features and higher performance but at a lower cost than the EA7 series, prices start at \$499 for the 6-inch base model (without Ethernet).

The EA9 series touch panels are equipped with 800 MHz CPUs, 64k colors, and reliable 50,000 hour backlights. Hardware includes three serial ports (one on 6-inch base model), an Ethernet 10/100BaseT port (full-featured models), two USB 2.0 ports (one type A, and one type B), and one slot for optional SD memory card; 12 and 15-inch models support two SD cards and are equipped with one HDMI video output port. The 6, 8 and 10-inch units support 26MB

project memory; 12 and 15-inch units contain 82MB of project space. An audio output port, when attached to an amplifier and speaker(s), can play warning sounds or pre-recorded messages (full-featured models).

All touch panels are 12-24 VDC powered; an optional attachable AC power adapter is available to power the panels from a 100-240 VAC 50/60 Hz voltage source.

All models are NEMA 4/4X and IP65 rated (when installed properly; for indoor use only) and are compatible with the EA9-PGMSW programming software, priced at \$99.

C-more touch screen interface panels are backed with a two-year warranty.

For more information, visit:

www.automationdirect.com/c-more ■

New C-more® Touch Panels

Higher Performance, Lower Price



The popular **C-more** HMIs have ALWAYS been a great value, but now they are better than ever. We have included some of the latest technology into the new EA9 series C-more panels, and all at a lower cost to you. But don't let the lower price fool you - with a redesigned, more robust housing, thinner bezel, LED backlights and more communications and data storage options, the EA9 series offers even more value and performance.

ALL EA9 SERIES C-MORE PANELS INCLUDE:

- 800 MHz processor
- SD memory card slot for data logging
- One USB 2.0 A-type and one USB 2.0 B-type port
- Serial communications interface
- 26MB project memory space (82MB on the 12- and 15-inch units)

FULL-FEATURED MODELS ADD:

- 10/100Base-T Ethernet communications
- Additional SD card slot on 12- and 15-inch models
- Two additional for a total of three serial communications ports (RS-232, RS422/485)
- One HDMI Video Output (12- and 15-inch units only)

REMOTE ACCESS AND CONTROL BUILT-IN

- No Additional Hardware required. The C-more Remote Access feature resides in all EA9 panels with Ethernet support, and requires no option modules. Access real-time data or initiate an action on a control system from anywhere, any time.

CONNECT TO CONTROLLERS WITH DRIVERS FOR:

- All AutomationDirect programmable controllers
- Allen-Bradley - ControlLogix®, CompactLogix®, MicroLogix™ Ethernet, SLC Series, FlexLogix, SLC® 5/05 Ethernet™
- Modbus RTU and TCP/IP Ethernet
- GE SNPX
- Omron Host Link Adapter (C200/C500), FINS Serial and Ethernet
- Selected Mitsubishi FX Series, Q Series
- Siemens S7-200 PPI and S7-200/300 Ethernet (ISO over TCP/IP)

HDMI



The C-more EA9 series 12- and 15-inch panels now have an HDMI video output port. This allows you to connect HDMI devices like larger screen TVs to the C-more panels for longer-distance viewing of operator screens.

Research, price, buy at:

www.automationdirect.com/c-more

Order Today, Ships Today!



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the #1 value in automation

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RHINO® line of DC Power Supplies expanded



RHINO PSB series DIN rail mount single-phase and three-phase input power supplies with IP20-rated terminals offer high performance and reliability and are perfect for applications that require a basic DC voltage power supply.

The series features rugged plastic or aluminum housings and output status LED indicators as well as overload, overvoltage and thermal protection. Five new models are approved for Class I, Div. 2 hazardous locations and one new unit is UL 1310 recognized (NEC Class 2). DIN Rail mount 12, 24 and 48 VDC output, 85-264 VAC/ 120-375 VDC single phase input voltage power supplies are available starting at \$21.50. Three-phase, 320-600 VAC input versions, starting at \$59, are available with 24 VDC outputs from 60 to 960 Watts. RHINO PSB series redundancy modules (from \$35) help prevent costly downtime due to power supply failure, and a new buffer module (\$149) is a cost-effective alternative to battery-based backup systems. RHINO PSB series power supplies are backed by a three-year warranty. For more information, visit:

[www.automationdirect.com/
dc-power-supplies](http://www.automationdirect.com/dc-power-supplies)

IronHorse® Fractional HP DC Motors and Gearmotors



MTPM series small DC motors range in size from 1/31 to 1/4 HP and have rolled steel totally enclosed non-vented (TENV) housings, high energy ceramic magnets and replaceable brushes. The motors are rated for SCR drives and accommodate 12, 24, 90, and 180 VDC. Fractional HP DC motors start at \$71. IronHorse MTG series 1/19 to 1/5 HP DC gearmotors are available with parallel or right-angle gear shafts in 12, 24, and 90 VDC versions. These gearmotors are designed for use on unfiltered SCR (Thyristor) type rectified AC inputs and can be used with PWM (pulse width modulated) type DC adjustable speed drives and in across-the-line applications. Features include TENV enclosures, Class F insulation and replaceable brushes. IronHorse DC gearmotors start at \$146.

View the complete line of IronHorse DC motors at:

[www.automationdirect.com/
dc-motors](http://www.automationdirect.com/dc-motors)

To learn more about IronHorse DC gearmotors, visit:

[www.automationdirect.com/
dc-gearmotors](http://www.automationdirect.com/dc-gearmotors)

WEG CWC series miniature contactors



The compact 45mm dimensions and up to 22A IEC current rating of the CWC series miniature contactors allows less space required inside electrical enclosures while still offering up to a powerful 15HP @ 460V. DC models feature low consumption coils allowing operation directly from a PLC. Three-pole and four-pole models are available. WEG CWC series miniature contactor prices start at \$11. Matching direct mount overload relays start at \$14. Accessories include auxiliary contact blocks, surge suppressors, Star-Delta electronic timing relays, wiring kits, and mechanical interlock and latch blocks.

To see the full line of WEG CWC series miniature contactors, visit:

[www.automationdirect.com/
motor-controls](http://www.automationdirect.com/motor-controls)

More 18mm and 30mm ultrasonic proximity sensors



AutomationDirect's new UK6 series 18mm ultrasonic sensors are now available with shorter bodies for easier mounting in tight spaces. Also, the new UT2F wide face

series of 30mm sensors has an increased sensing distance of up to six meters. Both series are available with 10 output types in combinations of PNP and NPN discrete outputs; 0-10VDC or 4-20mA analog outputs are available. These IP67-rated sensors are equipped with LED status indicators and have either an attached two-meter output cable or an M12 quick-disconnect connector. The 18mm UK6 series sensors start at \$89 and are available in sensing ranges from 40mm to 900mm. The 30mm UT2F series sensors start at \$325 and have a 350-6000 mm sensing range. Both series have complete overload protection, are backed by a lifetime warranty and are cULus, CE and RoHS approved.

To learn more about these new ultrasonic proximity sensors, visit:

[www.automationdirect.com/
ultrasonic-sensors](http://www.automationdirect.com/ultrasonic-sensors)

Productivity3000® gets additional rating



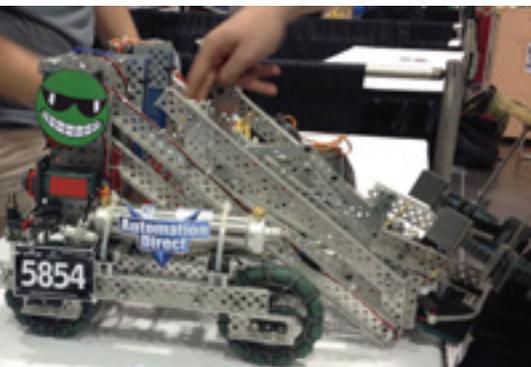
By now, you know the Productivity3000 controller offers a powerful industrial control solution with lots of flexibility and super communication power. Now Productivity3000 is ABS certified for use in marine applications. This standard of excellence in marine and offshore classification means Productivity3000 is ideal for use in ship-board automation and control systems on ABS class vessels and applications for Mobile Offshore Drilling Units (MODU) or facilities.

To learn more about Productivity3000, visit:

[www.automationdirect.com/
productivity3000](http://www.automationdirect.com/productivity3000) ■



PRODUCTS



AUTOMATION DIRECT SUPPORTS NATIONAL CHAMPION ROBOTICS TEAMS

AutomationDirect has always been a huge community partner and one of their primary missions is to inspire young minds in STEM career paths (Science, Technology, Engineering and Math). AutomationDirect is the founding sponsor and supporter of the Forsyth Alliance Robotics, an umbrella organization that supports the robotics program in Forsyth County, Georgia – the home of AutomationDirect.

The program started in 2006 as a single robotics team of 11 students and became a vision of having a robotics team in every school in Forsyth County. Today the Alliance has grown to over 125 robotics teams in the county with some schools operating over a dozen robotics teams. It has been a huge success and has gotten thousands of students interested in technology.

Students start in elementary school with Lego robotics. By the time they reach high school they have an opportunity to participate in FIRST Robotics, VEX Robotics, VEX-IQ Robotics, BEST Robotics, MATE ROV Robotics, and even electric car competitions.

However, the students aren't just participating, they're winning! It's not uncommon to see Forsyth Alliance teams competing at all levels and at regional and national championships. In particular, each year the Forsyth Alliance produces teams that qualify for the VEX World Championships. This is no small feat, considering they are competing against 10,000 other teams for the same honor. But this year it's extra special; the South Forsyth team took third place at the VEX World Championships, missing second place by only three points.

AutomationDirect fundamentally believes in giving back to the community and it is especially rewarding when we see programs like these get young minds excited about and engaged in learning.

Congratulations to the Forsyth Alliance and the South Forsyth team! We are behind you all the way! ■

AUTOMATION DIRECT RANKED AS ATLANTA'S TOP MIDSIZE WORKPLACE

AutomationDirect has been named Metro Atlanta's Top Midsize Workplace by the Atlanta Journal Constitution.

Employees voted the company to the top position in the medium-size company category by completing an online survey. The Atlanta Journal Constitution, partnered with Workplace Dynamics, hosted the survey which focused on specific categories relating to a company's workplace culture; the survey covered areas such as company direction, workplace conditions, execution, management, career, and pay and benefits.

In order to be considered a finalist, each company must reach a minimum level of employee participation, based on its number of employees. Companies were then ranked and finalists chosen in each size category based on their overall composite score. Winners were chosen based strictly on the results of the survey. According to the Atlanta Journal Constitution, winners are, in essence, chosen by the employees themselves. This year, approximately 1,000 companies were nominated.

Additionally, company captain Tim Hohmann was among the heads of three companies receiving the Leadership award, honoring those who lead by example.

Expressing gratitude, Hohmann commented, "Associates want to be accountable for achievable goals and want to be appreciated and awarded for achieving them. In addition, they want to have faith in the long-term viability



**TOP
100
WORKPLACES
2014**



The Atlanta Journal-Constitution

of their company as a form of family security. Companies should work closely with associates to establish these goals and must communicate regularly and openly with progress made and problems encountered toward achieving these goals. The end result will be high morale and increased productivity.”

The most recent award reflects the ongoing excellence of AutomationDirect’s company culture. The company won the same awards in 2012. Also, in 2011, AutomationDirect was recognized as the fourth in the top 25 best small and medium companies to work for in America by SHRM/Great Places to Work Institute. For this award, two-thirds of the organization’s score comes from employee survey responses; one-third of the score includes assessment of organization practices and perspectives from the leadership team.

Among their other recognitions, since 2001, the company has consistently been voted “Best in Service” by Control Design magazine readers.

Read the article in the Atlanta Journal-Constitution here:

<http://bit.ly/1iYjRvh> ■

68 WORKPLACE COMPLETE THE ATLANTA JOURNAL CONSTITUTION LOCAL NORTH 10 2014

TOP WORKPLACES

AutomationDirect.com

TOP MIDSIZE WORKPLACE: This Cumming company is generous with midday diversions and encouragement for workers to lead healthy, well-rounded lifestyles in and outside of work. But when the going gets tough, these employees are known to get going.

AutomationDirect.com is a leader. Warehouse floor picks items off a warehouse shelf at Atlanta's top midsize-sized workplace. One 21-year-old employee called it "the best place I ever worked." The plant's perks are many, but drive, expectations and methods such as a peer-to-peer grading system help keep people on their toes. PHOTO BY MARK PUGH/AJC STAFF

Work mixes with play

Industrial products distributor is named midsize Top Workplace for second time in 3 years.

By Mike Fleming
FUMFAC

The illustration fits well description as a historian. The historian pulls out a copybook and writes up pages of an ancient Greek-speaking system he devised for a futuristic gas state of matter. The collection of wild guesses and half-regretful ideas is submitted at an ancient 40 degrees, even during the space of winter storms.

More signs of the historian's nature are evident at AutomationDirect.com, an industrial products distributor in Cumming that is founded under a previous name in 1996. Working with the standard model for an on-the-job work situation, the company installed a work plan system that groups jobs by size, with slight irregularities. "When you walk through here, it's like a maze," he says.

The historian reports he will write up the plan. He will write up the plan. He will write up the plan. He will write up the plan.

approach needed in the concept of servant leader. By serving customers and before employees, it seems, one can become a leader in shaping vision, process, profits and core values.

"Best placed lower workload," said Markers (and, who last month turned 41, an age at which he had planned to retire before getting a taste of this world).

Dodd is assigned to the logistics "team," as the unit is known in the company's lingo, which calls to mind a reference to athletic departments. Those in charge of the team are expected. Former job titles are so broad-based upon that the team carries the modern tag of company captain.

The work world involves around Tuesday morning meetings that are attended or followed the rules by every all of the 200 employees and contractors pay roll staff. They come every day, a team of 200 employees, holding on the team to continue an active team.

MANUFACTURING WANTS YOU

As veterans leave the military, manufacturers are recruiting for their skills.

By TJ Johns,
AutomationDirect



I grew up in Dalton, Georgia. Known as the “Carpet Capitol of the World,” it seemed there was either a carpet mill or a carpet dealer on every corner. We were filled with pride when we would see carpet made in Dalton offered as prizes on shows like “The Price is Right” and used on various home improvement shows.

Most of my family worked in the carpet industry. I recall

my parents, my brother, and my sister coming home with stories of how much yarn was tufted that day, what new styles were shipping out, and how they enjoyed their jobs, even though it was hard work.

Over the last few decades, production costs for local manufacturing began to skyrocket. Like the carpet industry, many other U.S. manufacturing companies began offshoring.

Labor was cheap, shipping overseas was affordable, and taxes were bearable. The major drawback was that many Americans lost jobs and were forced to find new careers.

Today, the world economy is forcing companies to rethink the cost of doing business. Overseas shipping rates continue to climb and profit margins are decreasing. American manufacturers, as well as consumers, have grown tired of waiting weeks for ships to deliver containers of products from Asia and other parts of the world. They want a faster turnaround of higher quality products and they want to maintain good profit margins.

With continued technological advances in industry, many manufacturers realize that bringing production back to America is becoming less and less cost prohibitive. Automating the manufacturing process not only increases production and efficiencies, but costs about the same at home as it does in other

countries. For example, control equipment components, such as Programmable Logic Controllers (PLCs), purchased here cost the same there, and do the exact same thing.

With manufacturing coming back to America, that means jobs are returning as well. But who will fill those positions?

According to the Bureau of Labor Statistics, as of February 2014, there were approximately 250,000 job openings in the manufacturing industry. While down from almost 300,000 in February 2013, there is still a long way to go.

So why are manufacturers having difficulty in hiring workers? Some would think it's the competition. However, the real problem is finding skilled workers.

In an article written for the U.S. Department of Labor by Erick Ajax, vice-president of EJ Ajax and Sons, Inc., he says, “Actually, the concern on my mind is the need for skilled workers who can maintain the



quality and productivity that make our company competitive.”

Like Ajax, manufacturers are looking for dependable workers whom they can trust to maintain high quality productivity and who know how to keep production lines running smoothly. But where do they find these skilled workers? One place many manufacturers are looking is the military.

As the number of troops is being reduced in America, our numbers of unemployed workers is increasing. The men and women who have spent years defending our freedom are having, in many cases, a harder time finding employment than those who never served our country.

In the January/February 2014 issue of Plant Engineering magazine, content manager Bob Vavra writes, “The military requires rigid adherence to rules and orders. ... [Military personnel] understand the need to meet and exceed goals....”

Men and women in the armed forces are trained not only on how to operate highly sophisticated machinery and equipment. They are also instilled with the attention to detail and determination required to successfully complete tasks. This esprit de corps is what every employer desires in its employees.

In the April 7, 2014, The Island Packet article, “SC Readies for Outgoing Military Personnel Seeking Civilian Work”, Brigadier General Bradley Becker is quoted: “A lot of these folks shouldered a heavy load in Iraq and Afghanistan. They have a lot of experience and are tested in battle. But while they are experienced and tested, they haven’t been in the job market.”

Statistics show that around 300,000 troops leave the armed forces each year. Many of those are retiring from service, others leave because their tour of duty

is complete, and others have decided a military career is not for them. For several, the military is the only job they’ve had; many began serving right out of high school.

After being immersed in the military world of speaking in endless acronyms and following a strict regimen of discipline and determination, many of our troops experience what in essence is culture shock, when released into the “real world”.

Former soldiers quickly learn that the civilian work ethic is often drastically different from the military mindset. Rules and procedures are, generally, not followed closely like they are in a military setting. For many, this is disheartening and leads them to doubt whether civilian work is fulfilling.

A common issue our veterans have is successfully communicating their skills, training, and experiences to employers. After being accustomed to working in “team” settings, they also have difficulty explaining skills they have as individuals.

In the March 24th issue of the San Antonio Express-News, Erika Merrill wrote the article, “Unemployed Veterans Deserve Our Help”. She states, “Our veterans are still in need of ways to translate their military occupational specialties to the civilian sector and ease their transition back into the workforce.”

As more and more manufacturers become aware of stresses like these that former military personnel experience while transitioning into civilian life, they are seeking ways to help make this transition a smooth one.

Plus, with today’s industrial technology, manufacturers realize there is less need of general job skill training. Instead, by focusing more on job-specific training, better skills are learned and

job performance is greatly improved.

Manufacturers have begun enlisting assistance from job placement services and programs whose emphasis is on helping these veterans and their transition from military life to the civilian workforce.

Across the country, programs are now available to help veterans with the transition to civilian life.

These programs, both private and public sector, assist veterans in areas ranging from preparing a resume, to preparing for interviews, self-marketing and networking.

Hire Heroes USA (HHUSA), in Alpharetta, Georgia, has a national reputation for helping veterans (and their spouses) find employment.

In 2013, HHUSA received the Activision Call of Duty™ Endowment Seal of Distinction for veteran job placement excellence. Their highly trained team of military and business veterans uses a personal approach to help veterans obtain dedicated assistance in overcoming employment roadblocks.

According to their Web site (www.hireheroesusa.org), they provide workshops and one-on-one collaboration to assist veterans in learning not only how to build an impressive resume, but to also learn communication skills that provide the value needed to convince interviewers they are the right person for the job.

Brian Stann, HHUSA president and CEO says, “The transition from military to civilian life can be difficult. And many former service members struggle with the adjustment for years.”

His team’s goal is to provide veterans with the tools, support, and confidence they need to make the transition a success.

>>

Did you know?

- In 2012, the unemployment rate for Gulf War-era II veterans – those who served on active duty in the U.S. Armed Forces at any time since September 2001 – was 9.9%.
- In 2012, the unemployment rate for young male Gulf War-era II veterans (18-24) was 20% compared to young male non-veterans at 16.4%

Source: Bureau of Labor and Statistics 2013

>>

There are many other veteran transition assistance organizations. The U.S. Department of Labor also provides a wealth of information for veterans seeking employment. (www.dol.gov/vets/)

Colleges and technical schools have also joined the movement to aid veterans in transitioning from military life.

For example, Georgia Tech offers a Veteran Education Training program which is structured to help convert veterans' military knowledge for use in the civilian workforce. (www.pe.gatech.edu/military-transition-programs)

Manufacturers understand that by using programs and services like these, they can obtain dependable, skilled workers and our veterans can have a career that also gives them a sense of pride, respect, and support.

For all our veterans do to secure and maintain our freedom, helping them re-acclimate to civilian life is the least we can do. With great programs such as these, our veterans can have the promise of a bright future. ■

Are you a veteran looking for transition assistance? There are several organizations available to help. Here are just a few:

- **Hire Heroes USA**
(<http://www.hireheroesusa.org>) has a mixed team of military and civilian business veterans with tools to effectively train veterans in self-marketing and networking to get good jobs with great companies.
- **Workshops for Warriors**
(<http://www.workshopsforwarriors.org>) provides training for veterans leaving service in the San Diego, California area. They have received support from organizations such as the National Tooling and Machining Association, the Association for Manufacturing Technology, the National Institute for Metalworking Skills, and more.
- **Get Skills to Work**
(<http://www.getskillstowork.org>) is a network of over 190 manufacturers which provides expanded career opportunities for U.S. veterans in advanced manufacturing.
- **America's Heroes at Work**
(<http://www.americasheroesatwork.gov>) is a U.S. Department of Labor program that assists veterans through its Veterans Hiring Toolkit. It also focuses on specific issues, such as Post-Traumatic Stress Disorder.
- **Veterans Opportunity to Work**
(<http://www.benefits.va.gov/VOW>) assists transitioning service members with career guidance, training, and counseling assistance, as well as extended job readiness assistance and more.

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NEW DO-MORE DESIGNER PROGRAMMING SOFTWARE FEATURES

By Chip McDaniel,
AutomationDirect

Do-more Designer is the full-featured programming tool for the Do-more CPUs that can be downloaded for FREE. That's the entire Do-more programming package, NOT a demo version, for FREE. The software package already includes outstanding features such as a Project Browser, Data View, Trend View, PID View, Debug View, and a built-in simulator that creates a virtual PLC for you to test your logic without a PLC present. If all that isn't enough to get you excited about Do-more Designer, AutomationDirect has added new features with the release of Do-More Designer Version 1.3.

Intuitive Project Management

All project files are stored on board the CPU, which means no more searching for the old laptop with the most recent copy of the program before you can fix your machine.

You can also store your own files with the disk-based version of the project to aid future improvement or troubleshooting efforts. Do-more Designer gives you the ability to store PDF, HTML or virtually any file format (up to 10Mb) that you want to keep with the project for reference, or information to assist your coworkers or customers whenever they open the project.

The Project Browser window (Figure 1) makes it easy to select the code block you want to view or edit. System tasks are predefined for many common actions. Jump directly to any part of your code with just a few clicks.

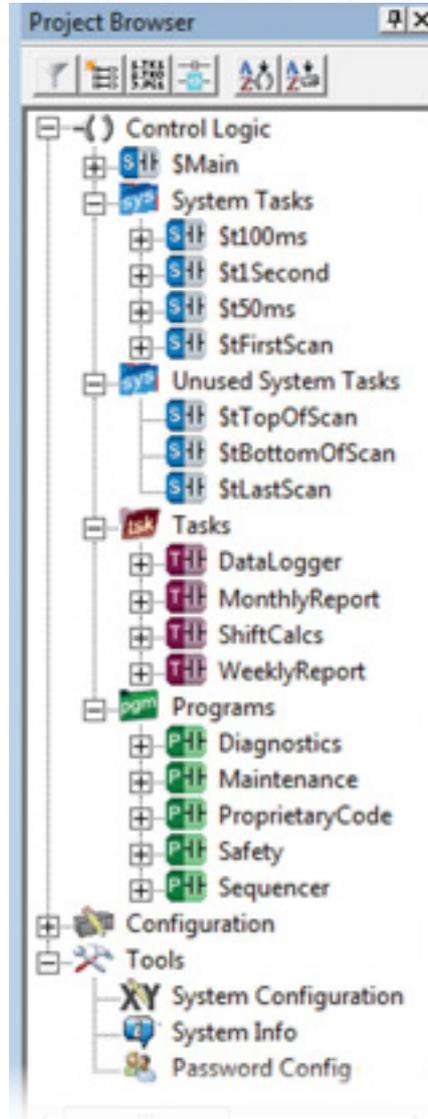


Figure 1: Project Browser window

The Do-more Designer software even supports “restore points”, which are basically previous versions of your program that you saved at known good operation. It's nice to know that you can easily “roll back” your project if your development goes awry.

Data Logging

This software release also includes a new version of the DmLogger.exe utility which now supports a file logging mechanism that allows any message sent to the DMLogger to also be written to a file on a PC running DMLogger. Users can now take advantage of a totally

free data logger for their Do-more PLC controlled machines.

Project Migration

Do-more Designer version 1.3 also includes a **DirectLOGIC** Migration Utility that helps you migrate an existing **DirectSOFT** project to a Do-more Designer project.

This utility takes the project export (.txt file) from any **DirectSOFT** 05/06/205/350/405 project and brings it into Do-more Designer as a Designer project.

Although the Do-more architecture is different from **DirectLOGIC**, most of the contacts and basic coils migrate well, along with many instruction boxes. Of course, all Element Documentation (Nickname, Wiring Info, Description), and Ladder Comments are brought in unchanged.

For any instructions that are now obsolete or are implemented differently, a ‘Stub Instruction’ is created as a place-holder within your Designer project to alert you that additional editing will be necessary. The user is responsible for recreating the original functionality at each location where a stub is inserted.

The Migration Utility is a tool that can assist in the conversion of your project – it is not 100% automatic. If any element does not map directly to a Do-more element, it is mapped to an Unassigned Nickname so you can address it later. All original **DirectSOFT** element text is appended to the Do-more element's six-line Description documentation field to assist with the migration process. Access this new utility via the File->Import >Migrate **DirectSOFT** project menu.

OEM Project Distribution

The DMLoader utility allows OEMs to quickly and easily replicate and distribute Do-more Designer projects to end users. The OEM creates an “image” file, and the upgrade can be performed with any PC running the DMLoader utility with that “image”.

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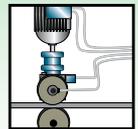
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Basic Process



Motion



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>> The end user does not need to install or understand the Do-more Designer software to perform the upgrade. The OEM can opt to password protect the project file and can also target a specific PLC via a special \$ProductID register, and prevent the end user from loading the project on any other PLCs that are not 'targeted'.

DMLoader is quite flexible and has several options to specify which parts of the PLC environment are to be upgraded. The OEM can even "brand" the screens that the end user sees with their own logo or banner artwork for a personalized user experience. **Figure 2** is a screen shot of the various DMLoader options available to the OEM.

There are quite a few additional enhancements to the editor, the firmware, and several of the instructions. Learn all about Do-more and Do-more Designer by visiting:

www.do-moreplcs.com ■

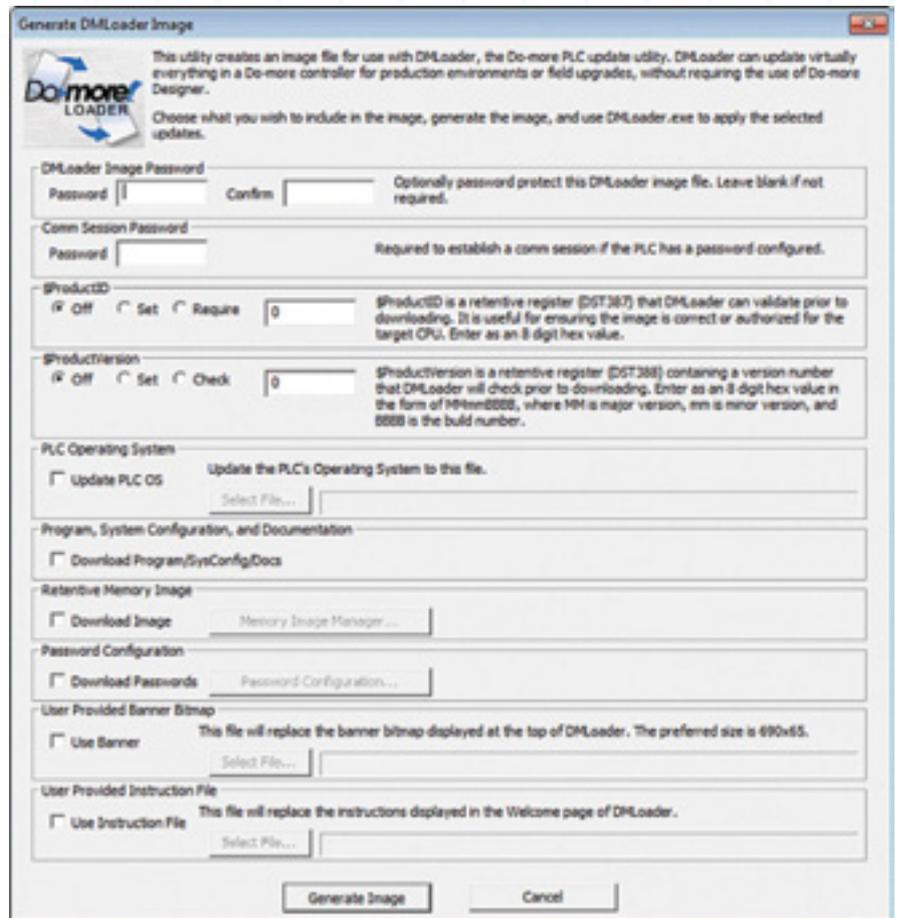


Figure 2: OEMs can use this utility to distribute projects to customers who have little or no PLC programming experience.



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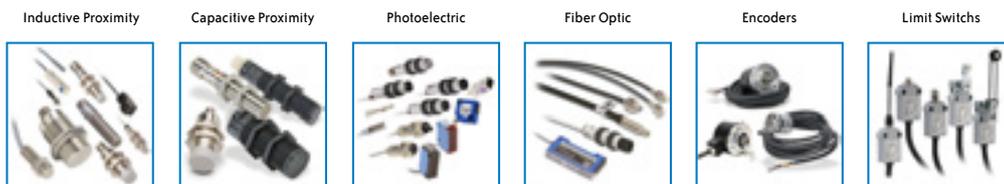
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AUTOMATION SYSTEM RETROFIT TRANSFORMS 175-TON HYDRAULIC FORMING PRESS

In less than one month, a rebuild automates press operations to increase production rates and improve quality.

By Scott Martin, President, KCC Software

Southern Manufacturing Group (SMG) located in Morrison, Tennessee, was founded in 1993. The company makes automotive components and industrial valves. In the fall of 2012, the automation system for its 175-ton hydraulic forming press received electrical damage resulting from a lightning strike (**Figure 1**).

Purchasing a new hydraulic forming press would be prohibitively expensive, in the range of hundreds of thousands of dollars. Therefore, SMG needed a company that could repair the forming press in a minimal time-frame to maintain its production schedule.

Required repairs included either replacement of components on the existing antiquated automation system, or a completely new automation system. The decision to either repair or replace would be driven by multiple considerations including cost, schedule, and functionality of the old versus the new automation system.

Repairing and Improving the Press

Although the press is 40 years old, it's still a very robust machine that was definitely worth repairing. A dual-action press, it shapes two separate parts in different ways at the same time. During the first step the hydraulic forming press bends the metal in half without creasing it; in the second step it rounds the metal piece. After the first step the metal piece moves to the second step, and a new piece is inserted to the machine for bending.

This continuous process significantly increases production yield as compared to simpler machines that only shape one part at a time, but it also requires more

than a simple automation system, as multiple operations need to be controlled simultaneously to close tolerances.

In order to get the hydraulic forming press working again, SMG turned to fully licensed electrical and mechanical contractor American Construction Technologies (ACT) in Nashville, Tennessee to find an economical and timely solution.

When ACT inspected the press, its engineers were faced with multiple challenges, including the repair or replacement of the automation system. At this point ACT called KCC Software in Huntsville, Alabama, for an automation solution that would not only work with the existing machine, but also improve it.

Our longtime business partner ACT called us because we specialize in software programming and technology integration for manufacturing customers. While ACT would build the new automation system enclosure and perform all wiring, as well as improving and updating parts of the hydraulic system, we would take on the challenge of quickly creating a new, modern automation system.

Designing the New Automation System

Even presses designed 10 years ago often don't have the automated features and functionalities that help manufacturers decrease cycle times and improve production consistency. For example, the old automation system couldn't automate press runs, so operators needed to manually enter instructions with each job setup. Not only did this add to cycle times, it also significantly increased the possibility of error and inconsistent part runs. The old automation system also lacked modern features and functions, and was becoming difficult to support.

For these and other reasons, SMG was willing to consider replacement rather than repair of the old automation system, provided the replacement system could be designed and installed quickly, and



Figure 1: This 175-ton hydraulic press was severely damaged by lightning, necessitating repair or replacement of many key components, including the automation system.

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>> for a reasonable cost. Preliminary investigations were sufficient to allow us to satisfy SMG's requirements, so we began the next step of new automation system design.

KCC Software began design of the automation system by considering the system requirements –pressure transducer feedback, encoder feedback, fast response times, accurate and timely valve controls – indicating that a very flexible controller was needed.

We've been a long-time satisfied user of AutomationDirect products, so we selected their Do-more series PLC CPU module along with a high-speed counter module to interface to the encoder on the press. The other I/O cards selected for the PLC were standard **Direct**LOGIC 205-series cards for the discrete inputs and the relay outputs required by the press, along with an analog input card for pressure transducer feedback.

There were many reasons why we selected the Do-more PLC for the automation system retrofit, besides previous positive experiences with AutomationDirect. The PLC is extremely fast and very easy to program, yet very affordable.

This PLC offers programs and tasks, essential to a well-designed automation system controller program, particularly for this application. Not all PLCs provide these controllable program segments, especially not the less expensive and more compact models. These features enabled us to separate the code into manageable pieces; its programs and tasks can also be employed multiple times inside a program, as well as used to develop new programs.

A key step was programming the force of the hydraulic press to match the preset movements of the machine. The correct pressure together with the corresponding ram travel plus other key parameters were stored in the new controller's memory by job number, and were configured to be automatically preset by the die setter. For deep drawing operations,

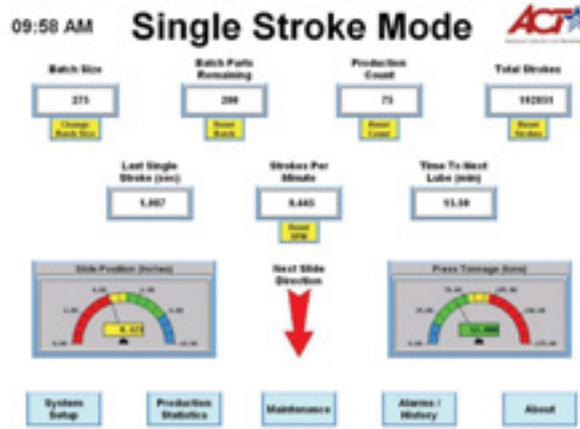


Figure 2: The new HMI gives the operators the ability to perform touchscreen commands to automatically control the press, eliminating the need for manual adjustments.

the blank holder or hydraulic die cushion force was programmed to be varied through the press cycle, improving operations and reducing machine wear.

The high-speed counter interface module helped us design, program and verify the encoder interface in just over an hour. Ironically, this was the part of the automation system design that concerned us the most, yet it turned out to be the easiest as the wiring and data connection were very simple, and the programming required very little math due to the built-in functionality of the module, plus its seamless integration to the PLC's CPU module.

We chose the AutomationDirect 15-inch C-more touch screen for the system HMI. This panel offers large, easy-to-read screens with password-protected access to maintenance screens and documentation, along with other features not available on the older automation systems.

Better Than New

Adding a powerful PLC and HMI panel to the 175-ton hydraulic forming press gave the operators the ability to perform touchscreen commands to automatically control the press, eliminating the need for manual adjustments (**Figure 2**).

In addition, the new automation system stores multiple programs or recipes, improving both cycle

times and positional accuracies. Prior to the rebuild, operators had to manually enter the program parameters for each new job. Now, the press operator simply selects the desired recipe, which contains values that have been checked through qualifying runoffs (**Figure 3**).

Another key feature of the system is statistical analysis of the press' performance. This enables SMG machine owners to detect potential hydraulic issues early on, and also ensures that the machine operates within established parameters.

SMG also created additional quality checks to ensure the machine was running according to its specifications. The automation system now measures the depth of the press as it presses on a part. Operators now know the depth of a motion to 1/100th of an inch on a 6 to 7 inch stroke length. This helps them predict when the die needs sharpening, or when the hydraulics need repair.

The reversal of the press is a critical production process as it prevents parts from falling out of tolerance. Prior to the rebuild, the old automation system required a manual proximity switch to signal positioning on reversal. Unfortunately, the manual switch accuracy was dependent on the steadiness of the operator's hand.

The new PLC-based automation system has automated the reversal of



Figure 3: Main user screen showing present batch order and some of the machine's performance indicators. Buttons across the bottom of the display provide access to the system management screens.

direction step, which is now based on measured pressure. This has made the depth of the press motion extremely consistent, ensuring part uniformity and extending the life of the machine.

As efficiency increases due to automation and improved operation, wear on the oil and hydraulic components is reduced. If the press depth starts to change, it's usually an indication of a hydraulic leak or a problem with the die that helps form the part. By being able to address these issues before the machine goes out of tolerance, SMG can keep operating without unscheduled downtime.

Installation One Month after Commissioning

Communication and cooperation among SMG, ACT, and KCC Software was critical to project speed and success, particularly as the schedule was very compressed to avoid downtime. The automation system retrofit began in late October 2012, and the replacement automation system was installed and operational before the end of November 2012.

The PLC programming software includes a simulation feature, allowing users to program simulated versions of machine operation.

Programming these simulated operations, and testing them against the PLC code, eliminated the need for I/O hardware during testing, which facilitated rapid prototyping and development. This capability also enabled the concurrent engineering with ACT that was essential to meeting the rapid schedule demanded by the project.

By using the PLC base and modules, we were able to guide ACT in the integration and wiring of the control panel based on existing drawings and knowledge. Although the Do-More is a newer PLC, it leverages existing, familiar components and modules to make integration and documentation easier and quicker for those who have prior experience with AutomationDirect's legacy PLCs. Since installation, the press has run flawlessly. SMG is very pleased with the performance of the new automation system. Particularly appreciated are the recipe functionality, access to the performance data, and the ease of setup and maintenance when changing dies or performing routine preventative maintenance.

The press now only requires semi-attended operation to achieve exact positioning, which is critical to both operator safety and product quality. The maximum press depth is extremely consistent, and the automation system's setup screens enable users to tailor desired performance to exacting standards.

SMG was also very pleased that the final cost that was approximately 50 percent less than an earlier quote to simply replace the controller boards, confirming our original estimates. By using high-quality yet affordable automation system components, we were able to keep expenditures down, while still delivering a dramatically improved automation system in less than a month. ■

NEW C-MORE EA9 SERIES HMI

By Greg Philbrook,
HMI & Communications
Product Manager, AutomationDirect



The popular C-more HMIs have always been a great value, but now they are better than ever. We have included some of the latest technologies in the new EA9 series C-more panels, and all for a lower cost to you. But don't let the lower price fool you; with a redesigned more robust housing, thinner bezel, LED backlights and more communication and data storage options, the EA9 series offers even more value and performance than the earlier EA7 series panels.

Here we review some of the new hardware features and answer some frequently asked questions about the new C-more panels:

Q: Since you now have the new the C-more EA9 series, what is going to happen to the EA7 series?

A: The EA7 series has served many customers well over the years and many continue to operate in the field. However, the older technology components for the EA7 series are becoming more difficult to acquire. AutomationDirect plans to

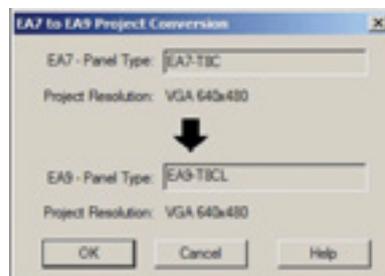
continue offering the EA7 series until 2016 if possible. We have made every effort to make the transition into the EA9 series as smooth as possible for our EA7 series customers.

Q: What programming software will I need for the new EA9 series?

A: We have released a new software part number (EA9-PGMSW) for the new EA9 series. This software starts with version 5.0. (You did not miss anything. There were no previous released versions). This new software platform will allow us to offer new features into the future.

If this is your first time using the C-more product, you will only need to purchase the EA9-PGMSW software for \$99. If you already own a version of the C-more programming software, you simply download the EA9 software from our Web site and use your existing software key code to install it free of charge.

Q: Will my earlier version C-more projects work in the new hardware?



A: The EA9 series is designed to work with projects that were created for previous EA7 versions. If you have C-more projects from earlier versions, you will need to open the EA7 version of the project in the EA9 software. The EA9 series software will recognize the

saved EA7 series file format on your PC and guide through conversion.

One item to note is that the software version 5.0 and later cannot connect to the earlier EA7 version C-more panels. The earlier software is still used to connect to the EA7 series panels (EA-PGMSW).

Q: Can I mount the new panels in the same enclosure cutout?

A: The EA9 series has the same cutout size as the previous EA7 series. This allows you to take the old out and place the new in without any hassle; with the exception of the EA-6-ADPTR. The adaptor was made to adapt C-more EA7 to the old EZTouch wide bezel cutout. EA9 panels do not fit into this adapter.

Q: What improvements should I expect in the panel performance levels?

A: The EA9 series was designed to offer better performance for communications and project execution. We have updated the processor from 400 MHz to an 800MHz processor. This should create a strong foundation for applications that require several background tasks to be carried out while in operation.

We have also increased the memory size for the project runtime code and project storage. The 6, 8 and 10-inch units now contain 26MB project memory while the 12 and 15-inch units now contain 82MB of project space.

Q: How many serial ports does the EA9 series have?

A: Communications is a primary task for any HMI. That's why we have

increased the ability for multiple devices to be connected to the C-more panel. We now have a total of three serial ports that can be used with PLCs. These ports give you the ability to use RS-232C, RS-422, or RS-485 wiring based on which port is selected.

Q: Has the screen resolution changed?

A: The EA9 series displays offer higher resolution options on the 8 and 10-inch models. Using the higher resolution settings, you can fit more objects on the screen and the image will be sharper. Users starting a new project in the EA9 software will be able to take advantage of these higher resolutions when they create their projects.

The EA7 C-more series resolution on some panels was lower than the EA9 series. For projects created in software versions previous to version 5.0, the original resolution will be maintained when the project is saved into the new format and the user has the option to reconfigure the resolution size under the panel settings in the software at any point after conversion.

Q: How can I use the HDMI video output on the 12-inch and 15-inch panels?



A: The C-more EA9 series 12-inch and 15-inch panels now have an HDMI video output port. This allows you to connect HDMI devices like larger screen TVs to the C-more panels for longer distance viewing of the operator screens.

Q: What type of external memory support do you offer in the EA9 series?

A: SD memory card slots have been added to replace the older Compact Flash memory cards. The SD memory format is smaller and is also more readily available in the market. SD cards also offer much larger memory capacities.

Although the panel will support most SD cards in the market, AutomationDirect sells a recommended 2GB SD card that has been tested and proven to work well with the C-more product line.

Q: What voltage range does the EA9 series support?

A: We have added support for 12VDC to the EA9 series. The panels can now be powered by 12-24 VDC. The optional AC power adapter (EA-AC) that works with the EA7 series also works with the EA9 to power the panels from a 100-240 VAC 50/60 Hz voltage source. ■

**C-more HMI -
Six Models, Five Screen Sizes**

 EA9-T6CL-R \$499.00	 EA9-T6CL \$699.00
 EA9-T8CL \$999.00	 EA9-T10CL \$1,290.00
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URBANEDEN – “PEOPLE’S CHOICE” FOR A COST-EFFECTIVE AND ENERGY-EFFICIENT SOLAR-POWERED HOME

By Chip McDaniel,
AutomationDirect



UrbanEden, the University of North Carolina at Charlotte’s entry to the Solar Decathlon 2013, is a concept home consisting of four connected indoor and outdoor spaces that create a unique urban living environment. The interior adapts to maximize comfort year-round and opens to a private, plant-filled exterior living area. Innovations in concrete and glass technology, combined with the creative use of simple technologies, nurture a healthy urban lifestyle that is powered, heated, and even cooled by the sun.

The Solar Decathlon, a biennial event hosted by the U.S. Department of Energy, challenges collegiate teams to design, build, and operate solar-powered houses that are cost-effective, energy-efficient, and attractive. The purpose of the Solar Decathlon is to educate students and the public about the money-saving opportunities and environmental benefits presented by clean-energy products and design solutions. The event also demonstrates the comfort and affordability of homes that combine energy-efficient construction and

appliances with renewable energy systems available today. The program also provides participating students with unique training that prepares them to enter our nation’s clean-energy workforce.

One of the most unique features of UrbanEden is a retractable rack of solar photovoltaic (PV) panels which is automated using a wide array of AutomationDirect components. The retractable rack remains over the roof in winter to allow light from the sun to stream in through the southern window wall. During the summer, the rack extends over the patio to provide shade and cool the outside living space. This rack is powered by three 1hp inverter duty motors connected to three 40:1 IronHorse® gearboxes. The motors are controlled by three GS2 variable frequency drives, which receive serial commands from a Do-more™ PLC. An array of proximity sensors, and over-travel limit switches are used to position and pro-

vide fail-safe operation for the rack. The residents of the home control the movement of the rack via a 15” C-more® touch panel.

Charles Truong, the Electrical Engineering Student Lead for UrbanEden summarizes the engineering challenge: “In our initial design concept, the PV Rack System was controlled by a number of micro-controllers interfacing with various components like the HMI, VFDs, and sensors through serial communications and relays. The design itself was complex and required a team of students to design, program, develop, and debug. It would have taken weeks to accomplish this task. We didn’t have the time and resources to dedicate to the design. We needed a simpler and faster solution.”



Explaining the solution, Truong said, “Then

I ran across the Do-more PLC. Even though I had very little PLC programming experience beforehand, I found the Do-more PLC to be straight-forward and easy to use. The programming package was very user friendly and the simulation/debugging interface was outstanding.” He established RS-485 communications with the VFDs quickly using the built-in Modbus instructions, and had them under program control in less than two hours.

Additionally, Truong found setting up communication between the C-more HMI and the Do-more was also quick and easy. “I was amazed how easy it was to program the C-more HMI and to use it to access the various data registers in



the Do-more PLC. The interface between the HMI and the PLC was seamless.” He concludes, “The AutomationDirect components really made our design and development process a piece of cake. I just wish that moving and reassembling the entire house in California had been so easy!”

The design philosophy used to create the home was inspired by the city of Charlotte’s reinvestment in its urban core as the focal point of a thriving region. The ultra-efficient UrbanEden signifies a commitment to sustainability, vibrancy, diversity, and technological innovation. The house provides sophisticated urban ambience while helping occupants reduce their carbon footprint by fusing enthusiasm for the city with respect for, and intimacy with, nature.

Additional interesting features of UrbanEden include the use of pre-cast geopolymer cement, thus reinventing an historic building material. This geopolymer cement provides a sound barrier to city noise and a 90% reduction in carbon footprint over conventional concrete. Four rooms include both an indoor and outdoor component to maximize efficiency, comfort, and flexibility.

Reconfigurable spaces and elements include a living room and home office.

The living room features an entertainment center that transforms into a Murphy bed to accommodate overnight guests. An exterior living wall, or vertical garden, offers privacy while providing food, flowers, and the ambiance of a plant-filled room.

Beyond the retractable solar panels, other technologies used in the construction of the house include a hybrid passive-active hydronic radiant cooling system that pumps energy alone to control temperature, unlike conventional hydronic systems. A system of embedded “capillary” tubes circulates cool water through the high-mass, pre-cast concrete walls and up to a heat exchanger mounted on the roof. The heat exchanger removes heat accumu-

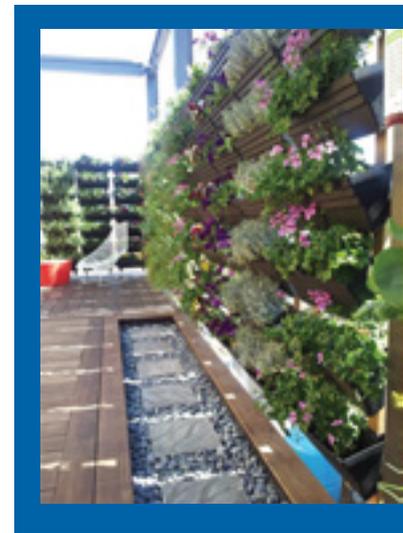
lated in the walls, resulting in cooling without the use of compressors or refrigerants. The use of geopolymers produces a unique concrete binder that contains no Portland cement and is one of the first-known uses of a geopolymer mix in a building envelope.

Originally envisioned as an urban infill project, UrbanEden is designed to appeal to both young professionals and empty nesters who value convenience of location, innovative technologies, balance between urban and natural settings, and sustainable features. The target market will enjoy a convenient location within walking distance of many dining, shopping, and entertainment attractions and close proximity to the city’s light rail system.

The students at UNC Charlotte designed and constructed the home on their campus in North Carolina. Then they had to disassemble the structure and ship it to California for the competition. The modular approach to the design was critical to this massive undertaking. The students then followed the parts to the Orange County Great Park in Irvine, California, to reassemble the home and prepare for the competi-

tions. They were joined by nineteen other teams from across the US, Canada and even two teams from Europe. The twenty teams were vying for juried awards in 10 categories. The UNC team competed in all categories, and achieved third place in the Engineering category. But the best result came from the voting of the general public. Thousands of visitors to the park toured all the homes over a 10-day period and voted the UNC entry as the top “People’s Choice” award, indicating that of all the homes on display, UrbanEden was the one that most people would wish to call home.

Now that the competition is over, the UrbanEden modules have been returned to the University of North Carolina at Charlotte campus where the house will be reassembled this summer to serve as a living and learning laboratory, allowing for further research, demonstration, and monitoring of the house’s innovative technologies.



About UrbanEden:
<http://urbaneden.uncc.edu>

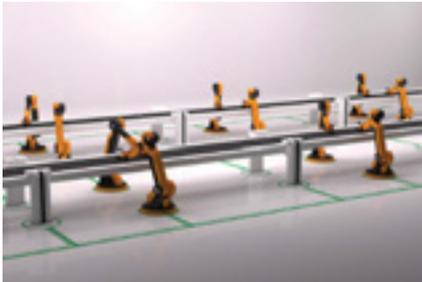
About the Solar Decathlon:
www.solardecathlon.gov

Additional Photos:
<http://solardecathlon.tumblr.com> ■

Brainteasers

By Chip McDaniel,
AutomationDirect

1.) Gridlock



The factory floor of the puzzle factory is filled by a grid of square work-cells 40 cells wide by 64 cells long. To celebrate International Puzzle Day, the Morale Improvement Committee wants to string a set of party lights overhead from one corner of the factory to the other. But before he approves their plan, the VP of Customer Prevention has asked how many work-cells this straight string of lights will cross? After the committee sent a representative down to the factory floor to count the affected cells – the VP revised his request and asked to know the general formula for determining the answer for any size grid. **Can you determine the number of cells crossed for this particular factory and the general formula for any size grid?**

Did you know that AutomationDirect now sells Dold® Trapped Key Systems that are perfect for ensuring safety for work cells and other factory environments? A “trapped key” system uses a series of mechanical locks and keys to control the access to gates or doors protecting operating equipment or machines, ensuring safe access to those machines. Systems are set up in a predefined sequence, preventing accidental access to running equipment. Visit: www.automationdirect.com/trapped-keys for more information.

2.) Puzzlement Day



This same committee at the puzzle factory proposed a company holiday to celebrate International Puzzle Day (IPD). But again the VP of Customer Prevention got involved by refusing to approve a holiday on Jan 29th (the actual date of IPD - really!) – but he allowed that the company could take a holiday on another day in January – as long as he approved of the date. One committee member proposed that the holiday should occur on an odd day of the month. One suggested that the date be greater than 13. A third member stated that they could not possibly celebrate it on a date that was a perfect square, while a fourth recommended all dates that are perfect cubes. Finally the committee chair stated that the holiday must be held before the 17th. The VP then emphatically declared that one and only one of those five proposals was acceptable to him – and stormed out of the meeting. **So, on what January day was the holiday taken?**

While AutomationDirect does have a generous holiday schedule for our team members, alas we do not take a holiday for International Puzzle Day. But remember that our Web store is open 24/7 for ordering your automation components!

3.) Finial Touchdown



The wooden flagpole at the puzzle factory was broken by high winds. The tip touched the ground at a point 20 feet from the base of the pole. It was repaired and then it broke again the following month at a point 5 feet lower on the mast, and this time the finial touched down thirty feet from the base. The broken portion did not actually detach either time. **Can you determine the height of the flagpole?**

During 2011, unusually stormy weather and high winds caused the top portion of the AutomationDirect flagpole to bend (it didn't break!). Subsequently, our stainless steel flagpole had to be removed, disassembled, and shipped to the manufacturer for repair. The arduous removal process took several hours. After several weeks, we were glad to have the newly repaired and polished flag pole back in place where we can once again proudly display our 30-foot by 50-foot banner of freedom! ■



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