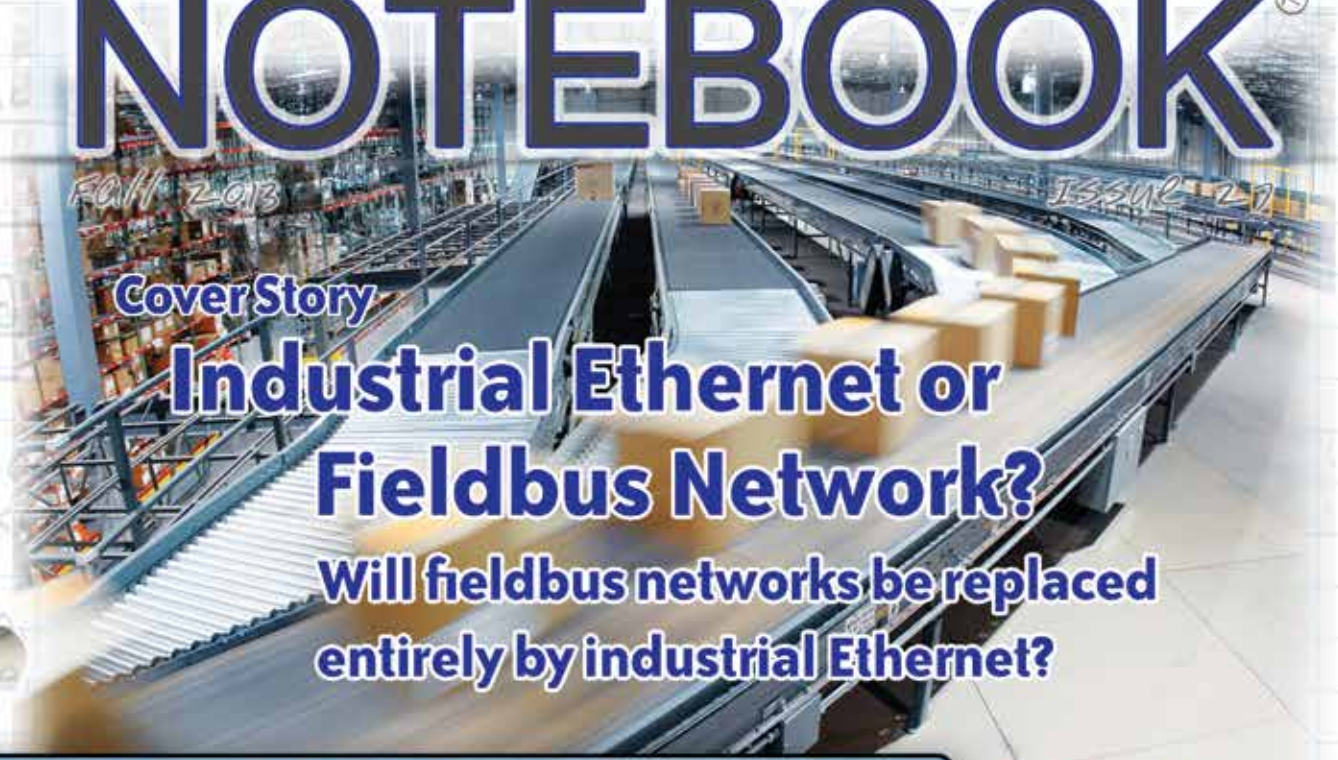
Your guide to practical products, technologies and applications

Automation NOTEBOOK®

FALL 2013 ISSUE 27



Cover Story

Industrial Ethernet or Fieldbus Network?

Will fieldbus networks be replaced entirely by industrial Ethernet?

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How to Access AutomationDirect 3D Models

Student Spotlight

Students help Manufacturing Center See AND Do More

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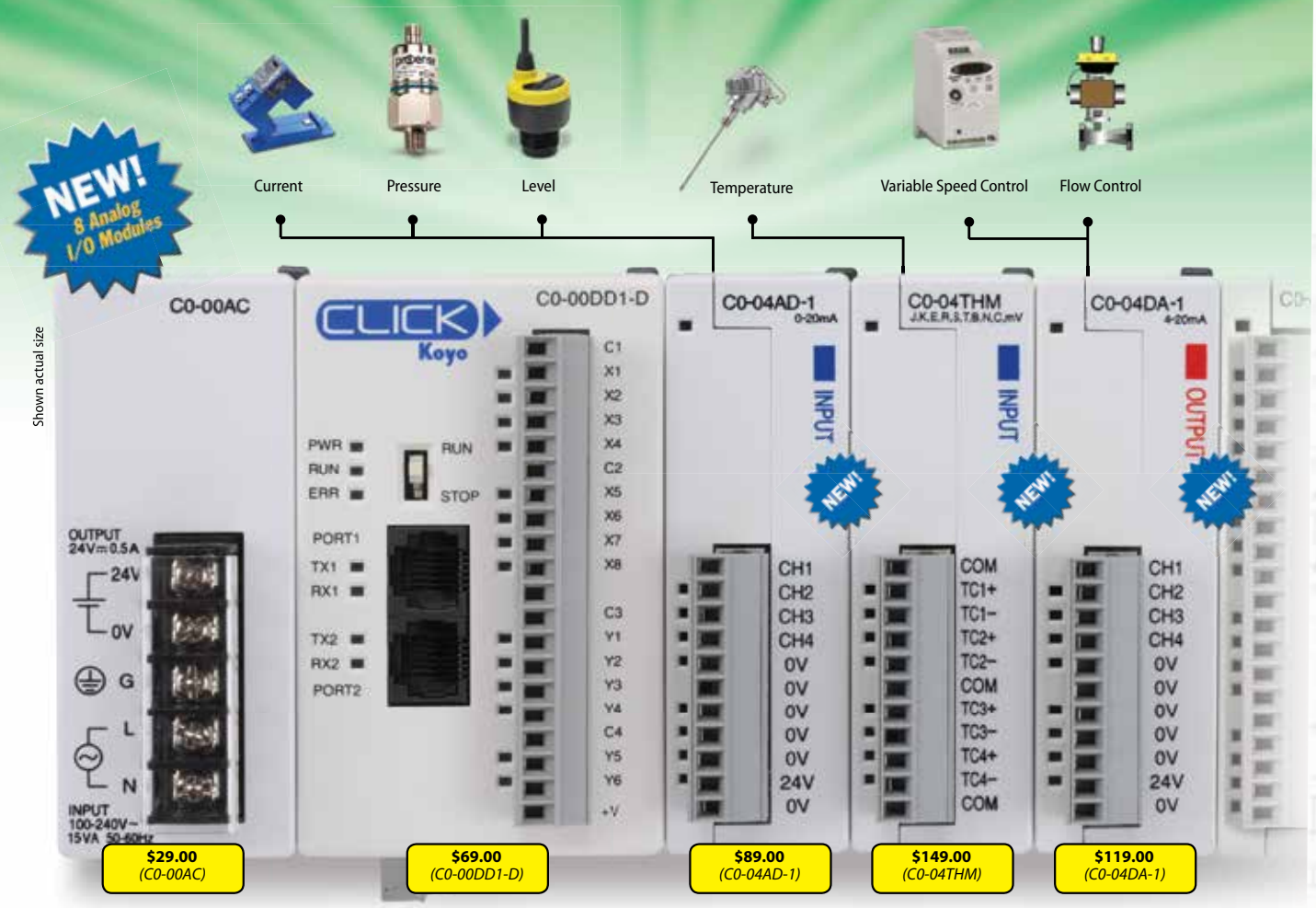
Now simply CLICK for analog

The best little PLC just got better



Connect to lots of process devices with new analog I/O modules for the CLICK PLC

The CLICK PLC now has more ways to help you with simple control applications. Monitor pressure, level, current, even thermocouples and RTDs directly. Perform simple variable control* with analog outputs connected to devices such as drives. These high-resolution modules offer fast setup (no DIP switches) with software scaling to make your life (and program) easier. Choose from:

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- 4-channel, thermocouple or RTD in (16-bit) $149 each
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** no PID*

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

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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

Did you make yours one crazy summer? Are you ready for the big cool down? For many of us, the summer heat was quite brutal. Now that's behind us and we can begin focusing on the cooler weather and the fun things to go along with that: camping, hiking, fall festivals, pumpkin farms, hay rides, and in just a few weeks, Halloween. Where does the time go? It seems like just last week we were planning summer vacations and beach time. Now we're busy planning how we'll design our jack-o-lanterns and which costumes will be the best ones to get us the largest amount of candy loot. I don't mean to brag, but my zombie makeup was an award-winner at last year's costume parade. But, enough about me; let's get ready for this issue of NOTEBOOK.

We've loaded issue 27 with informative technical articles, new product announcements and more. Our cover story explores whether industrial Ethernet will fully replace fieldbus networks. In our Tech Brief, you'll find how to access 3D models of our products. We turn our Student Spotlight toward Hickory, North Carolina where a group of students used the Do-more PLC to monitor a textile testing facility filled with washers and dryers. While we're in North Carolina, our User Solution story shows how the Do-more replaced a DL205 CPU in a hydroelectric plant.

Of course, Chip McDaniel has provided us with another mind-tingling, brain-wracking Breakroom, stocked with riddles and mind teasers that are sure to make you go, "Hmmm…". We're sure you will enjoy everything we have for you in this issue. Now, it's time to sit back, relax, and turn the page…

TJ Johns
Coordinating Editor
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New Product Focus

what's new

Analog I/O modules added to CLICK® PLC line

Since its introduction, the CLICK PLC family has proven to be an easy-to-use controller that is cost-effective in applications that would require just a few relays, and more flexible to boot. With a starting price of $69.00 for a discrete controller offering eight built-in digital inputs and six built-in digital outputs, this stand-alone micro brick PLC is by far the most practical choice for the money. It is designed for first-time PLC customers as well as experienced users.

More discrete and a full line of analog I/O modules have been added to the CLICK PLC family. A mix of up to eight I/O modules can be connected to a CLICK CPU module to expand the system I/O count to better meet the needs of a specific control application. Available 24 VDC combination discrete modules include 8-point DC input/8-point DC sinking or sourcing output models priced at $59; a 4-point DC input/4-point relay output model is also available, priced at $49.

Available 24 VDC four-channel analog input modules with 13-bit resolution include 0-20 mA current input and 0-10V voltage input versions, priced at $89; 12-bit resolution four-channel output modules in 4-20 mA current and 0-10V voltage versions are priced at $119. Also added is a four-channel input/two-channel output module in current and voltage versions. Priced at $149, this module features 13-bit resolution inputs and 12-bit resolution outputs.

Four-channel RTD and thermocouple input modules ($149) with 16-bit resolution have also been added.

The new CLICK analog modules are configured with the easy-to-use programming software, available as a free download or for purchase on CD for $10.

CLICK PLC Frequently Asked Questions

Q. How do you expand the CLICK PLC?
A. The CLICK is a rackless system, so you simply add I/O modules to the CPU by snapping them together via the connectors onboard.

Q. Is set up complex?
A. The CLICK PLC programming tool was designed with the user in mind. We have simplified the programming process to make it easier to learn, faster to program, and capable of completing most of your simple application needs with only 21 instructions.

The analog I/O modules are easily set up through the system configuration menu, including scaling.

Q. How many analog I/O modules can be used in a CLICK PLC system?
A. The CLICK PLC system supports up to eight I/O modules per system, all of which could be analog. You can mix any type of analog I/O modules in the system.

Q. How many analog I/O points can be used in a CLICK PLC system?
A. You could access up to 52 analog I/O points using an Analog CPU module and eight analog I/O modules.

Q. What types of RTD inputs does the C0-04RTD module support?
A. The C0-04RTD module supports the following RTD input types: Pt100, Pt1000, jPT100, Cu10, Cu25 and Ni120.

Q. What types of thermocouples does the C0-04THM module support?
A. A wide variety of thermocouple inputs are supported, including: J, K, E, R, S, T, B, N and C.

Q. Can I use different types of temperature sensors on a C0-04RTD and C0-04THM modules?
A. Yes. You can select a different sensor type for each channel, as long as it is supported by that module.

Q. Can I measure resistance?
A. Yes. The C0-04RTD module is ideal for measuring resistance from 0 ohm to 3,125 ohm.

See the full line of CLICK PLCs at **www.automationdirect.com/click-plc**.

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Product Snapshots

Press Releases

Flow switches added to ProSense line

FSD series flow switches monitor liquids to provide reliable flow detection. FSD series switches monitor 0.26 to 6.6 GPM or 1.32 to 26.4 GPM with a response of 10ms. The switches operate on 24 VDC and provide normally-open DC PNP outputs. Setpoints are easily set with the rotating dial and locked with a set screw. Valve bodies are constructed of nickel-plated brass. The flow switches have a 4-pin M12 quick disconnect and LED output status indication. ProSense flow switches are IP65 and IP67 rated and have a two-year warranty. Prices start at $125. For more information, visit: **www.automationdirect.com/flow-switches.**

ProSense mechanical pressure switches

MPS25 series mechanical pressure switches are designed for tough applications where conventional pressure switches are inadequate. Starting at $82, these switches feature an all welded 316 stainless steel sealed diaphragm actuator or a direct-acting 316 stainless steel piston design. The rugged 316 stainless steel housing provides reliable operation over a wide temperature range. Pressure ranges from vacuum to 7500 psig

are available; all models include a 1/4-inch NPT process connection and a precision snap-acting SPDT mechanically-operated switch output. ProSense mechanical pressure switches are UL, CSA, CE and RoHS compliant and are backed with a three-year warranty. For more information, visit **www.automationdirect.com/pressure-switches.**

More enclosure air conditioners

The Stratus line of enclosure air conditioners now includes 480 VAC models in addition to the 120 VAC and 230 VAC versions already available. These enclosure air conditioners provide optimal cooling while maintaining a closed loop environment inside the enclosure to keep out contaminates and are ideal for harsh higher temperature environments. Stratus air conditioners are sized from 2,000 to 8,000 BTU/H and are designed to fit enclosures as shallow as 12 inches. Each unit has a digital LED temperature controller with visible alarm and is pre-wired for external alarm monitoring. These high efficiency units contain an active condensate management system and are equipped with anti short-cycle compressor protection. The units are UL and cUL listed, have a 1-year warranty and prices start at $1,178. To see the full line of Stratus enclosure air conditioners, visit: **www.automationdirect.com/enclosure-cooling.**

Enclosure filter fan kits and exhaust grilles

The STEGO line of enclosure filter fans and exhaust grilles provides an optimum climate in enclosures. By channeling outside air into the enclosure, the interior temperature is reduced and heated internal air is expelled, preventing localized heat pockets and protecting electronic components from overheating. STEGO low-noise filter fans are available in 120 VAC or 24 VDC models; available sizes range from 12 to 373 CFM. Starting at $68, all models are impact resistant and feature easy filter change. Outdoor models are weather/UV resistant and fitted with a lockable door. Exhaust grilles, starting at $15.50, feature no-screw installation and are available in indoor and outdoor models. A lockable general-purpose protective cover is priced at $37. All STEGO filter fans are CE and RoHS compliant and are backed with a one-year warranty. To learn more about STEGO filter fans and accessories, visit: **www.automationdirect.com/enclosure-cooling**.

NITRA pneumatics line expands tubing offering

NITRA PTFE tubing is an excellent choice for many high heat applications. Its exceptional resistance to degradation of mechanical properties under severe conditions makes this tubing ideal for applications such as processing wash down equipment and higher pressure systems using compression fittings. This tubing is available in inch (1/4" to 1/2") and metric sizes (4mm to 12mm) in 100-foot rolls starting at $128.

NITRA UV stabilized PUR tubing is strong, flexible and an excellent choice for outdoor use such as landscaping, marine use, greenhouses and outdoor pneumatic applications. This tubing provides protection against UV rays of the sun and ultraviolet lights used in curing processes. UV stabilized tubing is available in inch (5/32" to 1/2") and metric sizes (4mm to 12mm) in 100-foot and 500-foot rolls starting at $12.

Learn more about NITRA pneumatic tubing products at: **www.automationdirect.com/pneumatic-tubing-hoses**.

Stainless steel pneumatic fittings added

NITRA stainless steel pneumatic push-to-connect fittings have 316 stainless steel bodies and 303 stainless steel gripping collets. Threaded components are 316 stainless steel. These stainless steel fittings withstand harsh chemicals and washdown applications. The fittings are available in NPT inch and BSPT (metric) sizes and can withstand pressures up to 290 PSI and

temperatures up to 390° F. The fittings can be used with polyurethane, nylon and PTFE tubing among others. Elbow and tee fittings with threaded connections can be rotated after installation. Available fittings include: straight unions, straight reducers, male straight and bulkhead fittings starting at $9.50; union elbows and male elbows start at $18; union tees, male branch tees, and male run tees start at $24.

Learn more about NITRA stainless steel fittings by visiting: **www.automationdirect.com/pneumatic-fittings**.

New line of economical terminal blocks

Konnect-It KN Series screw-type terminal blocks are available in a variety of single-level, double-level, triple-level, sensor, mini, grounding, fuse holder and disconnect block types. Konnect-It terminal blocks are economical, modular in design and fit on 35mm DIN rail (standard), or 15mm DIN rail (mini version). The terminal blocks are available in multiple colors, accept a wide range of wiring sizes and most have a 100kA SCCR rating. Konnect-It terminal blocks start at $30.00 for a 100-pack. Available Konnect-It accessories include end brackets and covers, separators, jumpers, marking tags, top covers and label holders.

You can see the full line of Konnect-It terminal blocks and accessories at: **www.automationdirect.com/Konnect-It**.

New NITRA air prep filters, regulators, and lubricators

With the addition of dozens of new models, NITRA pneumatic air filters, regulators, lubricators (FRLs), soft start/dump valves and air relief valves are available in 1/8 to 1-inch NPT female port sizes to meet a broad range of pneumatic air preparation applications. Modular design permits stand-alone or combined NITRA pneumatic FRL operations. ASD Series soft-start/dump valves allow pneumatic components to be pressurized slowly for safety and control. Soft-start valves are equipped with manual override, LED indication, and an integral gauge monitors system pressure. ASD valve prices start at $49.00. AGP series gauge port adapter plates ($5.50) allow mounting of larger pressure gauges and transmitters on regulators, filter/regulators, and soft-start valves. ADB series distribution blocks are used to divide the air stream between FRL components.

The complete NITRA line can be seen by visiting: **www.automationdirect.com/pneumatic-parts**.

Cover Story

The Future of Industrial Ethernet

Industrial Ethernet or Fieldbus Network?

By Christine Lesher, ControlsPR

Will fieldbus networks be replaced entirely by industrial Ethernet?

With only about a quarter of the overall installed base of industrial networking using 4-20 mA and other hardwired methods, fieldbus communication systems are becoming the de facto choice for automation. Now the debate is shifting to the question of whether fieldbus-based networks will remain the standard or if it will be supplanted by industrial Ethernet.

According to the Industrial Networking Q2 cover story "Industrial Ethernet Cruises Powerfully Along," an IMS Research report found that fieldbus-based communications systems accounted for 75 percent of new industrial automation network connections in 2011, three times more than those using industrial Ethernet.

However, IMS adds that Ethernet is growing faster and will become the dominant industrial networking technology within 10 to 15 years. Although the IMS study labels all non-Ethernet industrial networks as fieldbus, for our discussion we'll define fieldbus networks as those used in process applications to connect instruments and analyzers to the main control system, typically a distributed control system (DCS). Leading examples are Foundation H1, HART and Profibus-PA.

Device-level networks will be identified as those that connect discrete devices such as sensors, switches and motor starters to controllers, usually PLCs and PACs. Some of the most popular device-level networks use AS-i, CANopen, DeviceNet, IO-Link, Modbus and Profibus-DP.

While industrial Ethernet networks are certainly likely to grow in popularity in the automation world, not everyone is ready to abandon fieldbus-based communications. The explanation for this goes beyond fieldbus having a large installed base; there are definite situations in which fieldbus is the better choice over Ethernet. We'll look at real-life examples that demonstrate the value of fieldbus-based communications, and we will consider the future of device, fieldbus and industrial Ethernet networks.

Advantages of Device and Fieldbus Networks Over Ethernet
• Deterministic
• More economical
• Straightforward installation requiring less wiring
• Ease of calibration of instruments
• Access to more data — measurement as well as diagnostic
• Easier troubleshooting
• Less sensitive to electrical noise
• More physically robust connectors and components
• Easier to transmit power over network
• Spans longer distances without repeaters or switches

Table 1: Advantages of Device and Fieldbus Networks Over Evernet

Benefits of Ethernet-Based Networks
• Faster
• Same network for IT and automation
• More topology options
• Large variety of network analysis tools
• Easier to expand
• Readily available technical support
• Universal connectivity to controllers, I/O and other components
• Ability to transmit multiple protocols simultaneously
• Superior and rapidly improving price/performance ratio
• Easier integration with multiple wireless networks

Table 2: Benefits of Ethernet-based networks

Easier and Economical

When it comes to connecting field-level equipment — such as transmitters, control valves, motors, proximity sensors, encoders

and similar monitoring and control devices — to control systems, device and fieldbus networks are often the simplest and cheapest way to go.

CMD Corp. located in Appleton, Wisconsin, manufactures converting equipment for blown film (Figure 1). In the Industrial Networking cover story, Paul Johnson, senior electrical engineer at CMD Corp., explains, "Process controllers, temperature controllers, small AC drives and similar equipment typically have built in RS-232/RS485 ports." He adds that most HMIs and PLCs have the same ports, which enable them to support general-purpose protocols such as Modbus or DF1.

"We choose Modbus to save money. Ethernet support in many cases is an added expense. In some cases, Ethernet doesn't meet application requirements," says Johnson. Ethernet often can't communicate with legacy equipment, and when it does, static noise and high bandwidth issues arise. This reasoning is sound, according to Carl Henning, the deputy director at PI North America, the association for both Profibus and Profinet. In the cover story he states, "It doesn't make sense to put an Ethernet connection in a proximity switch or any other simple sensor or actuator."

Mallard Creek Polymers (MCP) in Charlotte, North Carolina, is a maker of latex products that also uses Modbus. Matt Bothe, engineer at MCP, says the company uses Modbus to communicate with several smart mass flowmeters to obtain flow and totalized measurements.

While Bothe admits device networks are preferable in many cases as a result of their broad installation base, determinism and familiarity, he also adds there are distinct advantages of these networks.

"Device networks generally possess advantages over analog/discrete systems, namely far less wire, ease of calibration, access to more data, ease of troubleshooting, and ease of installation," explains Bothe.

Determinism and Consistency

Determinism is a key difference between device and fieldbus networks and Ethernet. Supporters claim device and fieldbus networks guarantee a response time, while Ethernet can't. This differentiator is very essential for certain applications, such as position-dependent operations.

For example, if a dispenser is told to turn on exactly one second before the robot arrives on point, it must be extremely consistent. Sometimes a slight delay, such as 1.32 seconds, is okay as long as it's consistent. The latency in the robot controller's I/O configuration file can be adjusted for the 1.32 seconds.

While Ethernet is very fast, it isn't deterministic; it can't provide the consistency needed for factory automation when timing is critical. Sometimes the speed of Ethernet can overcome most of the determinism concerns, but not all of them. Speed will determine the packet transfer rate but not how collisions are handled.

The Importance of Distance

Distance is another important factor when considering Ethernet. While wired Ethernet is limited to about 100 meters, device and fieldbus network distances can be much longer.

Brian Radichel is business development manager at Purvis Industries in Dallas, Texas, a manufacturer of material handling and mechanical systems. He talks about his experience at a prior company that creates gypsum board. The number of drives in the system went from 40 to 70 during a process speed increase.

He explains that in a gypsum plant the distances between drive nodes and CPUs can be long. The drives were clustered in many cases, but one application required distances of 200 to 300 feet between each drive. The backbone was Profibus-DP, which easily handled the increased devices and distances with minimal network changes. He concedes the installation was slightly more complicated due to the daisy-chain topology of Profibus, but once the network was set up and addressed, the commissioning went smoothly.

The 100-meter distance limitation of Ethernet-based systems means they have no multi-drop capabilities, which is another factor that impedes their performance. In addition, they're more susceptible to noise that can degrade overall network performance. Fiber optic cable can be used, but its installation requires a great deal of skill.

Perhaps more importantly, using Ethernet to cover the same distance as a fieldbus network is more expensive. Fiber optic cable or routers are required, especially for a daisy-chain configuration, making Ethernet impractical in terms of both performance and installation costs

Figure 1: For performance and cost efficiencies, the CMD Global Drawtape System and High-Speed Bag Winder use Ethernet, DeviceNet and Modbus networks.
Photo source: CMD Corp., courtesy of Industrial Networking

Continued, p. 10>>

Cover Story Cont.

The Future of Industrial Ethernet

Continued from, p. 9

for outdoor, long-lead-length applications.

Fieldbus in Process Automation

Fieldbus networks are widely used in the process industries where they offer several advantages over Ethernet. One factor to consider is familiarity. As a result of fieldbus networks being used for a long time, engineers have discovered ways to use their advantages to solve problems that Ethernet can't.

For example, one company had applications that require devices to be connected through slip rings, and 10 MHz/100 MHz Ethernet doesn't transmit very well through slip ring assemblies. The engineers used their experience with device networks and implemented low-speed DeviceNet running at 56 kHz to avoid the problem.

While Ethernet is trying to establish itself in the process industry, Larry O'Brien, the global marketing manager at Fieldbus Foundation, isn't concerned. For O'Brien it comes down to energy usage, "Process field devices require power, and Foundation H1 provides digital communications and power over standard twisted-pair wiring," he says. He concedes that Ethernet does support power over Ethernet (PoE), but conveys the primary use of PoE is for phones, panels, access points and cameras — not field instrumentation.

Many process industries contain hazardous areas where implementing Ethernet at the physical layer is problematic. On the other hand, fieldbus networks can offer a two-wire, twisted-pair field level network that can be installed safely in a hazardous area. In addition, simple screw terminations are used, which are familiar to a device installer.

Diagnostics specific to process automation and control in the field are other key advantages of fieldbus networks. O'Brien explains that Foundation H1 provides sophisticated diagnostic and data-management capabilities, and a block structure that allows end users to implement function blocks in control valves or field devices for the purpose of implementing control in the field. He adds, "There's evidence that control in the field provides an 80 percent increase in mean-time between failures compared to traditional DCS control."

O'Brien illustrates his point with an example of a chemical plant in the Netherlands. The interface card in the DCS at the facility failed, which meant communication from the DCS to the field devices was interrupted. However, a plant shutdown was avoided because the control-in-the-field functionality of Foundation H1 enabled continued operation via direct communication among the measurement devices and valves.

While proponents point out Ethernet's ability to support wireless, the same capability is available with WirelessHART. In fact, since hundreds of thousands of process instruments already have HART installed, connecting to them via WirelessHART is simpler than with Ethernet.

Moving Forward

Ethernet is moving into automation at the device level. Ethernet-based protocols like EtherNet/IP and Profinet have been widely accepted as viable in robot end-of-arm tooling and PLC communications.

The initial concern with using Ethernet-based networks was fear that the level of determinism wasn't suitable for communication between the scanner and the device nodes. The determinism debate continues, but it doesn't appear to be cause for concern. Although respected and considered robust, proven and deterministic, device networks are being replaced by Ethernet.

Ethernet will work its way further down into simpler and simpler devices. Industrial Ethernet networks are faster, have greater bandwidth, unlimited node counts, improved diagnostics, easier upward integration, and can use standard wireless. They also have more topology options and clearly a place in the automation network mix.

The Fieldbus Foundation also sees the value of Ethernet in industrial applications, which is why Foundation HSE is based on high-speed Ethernet. Foundation HSE, running at 100 Mbit/s, is designed for device, subsystem and enterprise integration. It supports the entire range of fieldbus capabilities, including standard function blocks and device descriptions, as well as application-specific, flexible function blocks for advanced process and discrete/hybrid/batch applications.

While fieldbus networks are the standard and often a better choice for the process industries, Ethernet does have its advantages and uses. In fact, many companies are starting to use both network types, depending on the application.

"It's not the years in your life that count. It's the life in your years."

– Abraham Lincoln (1809–1865)

"The best time to plant a tree was 20 years ago. The second best time is now."

– Chinese Proverb

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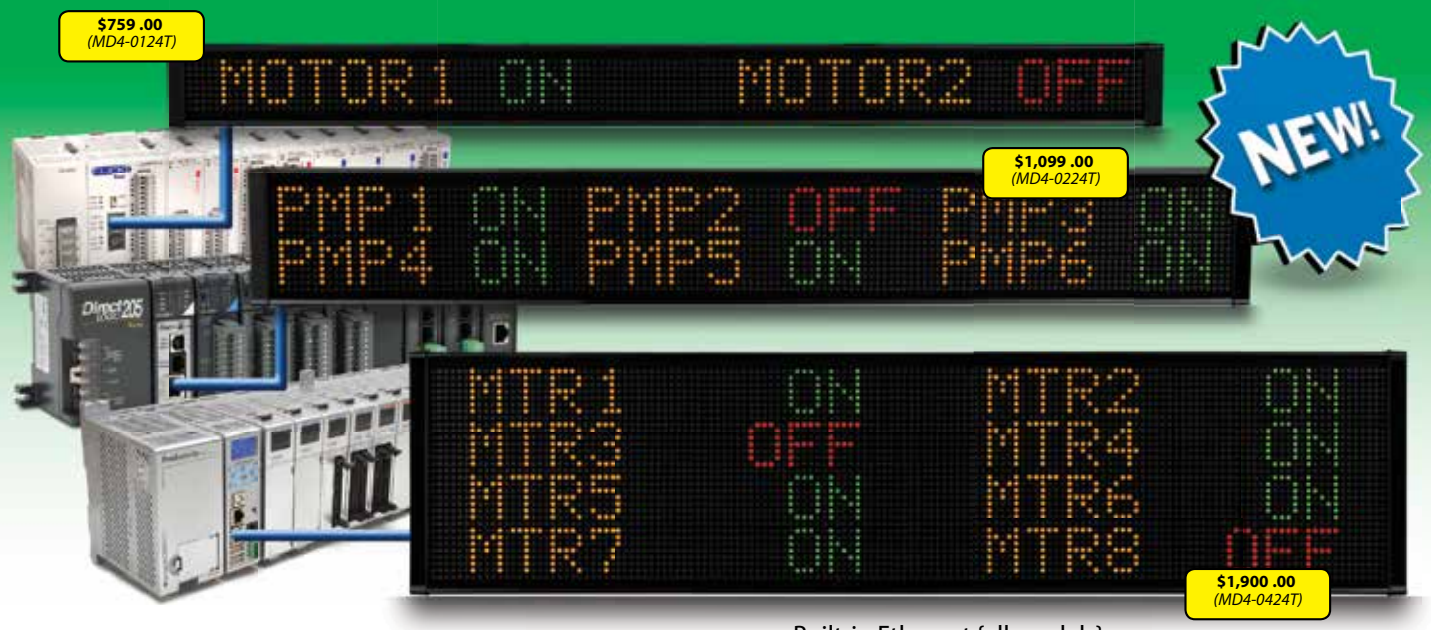

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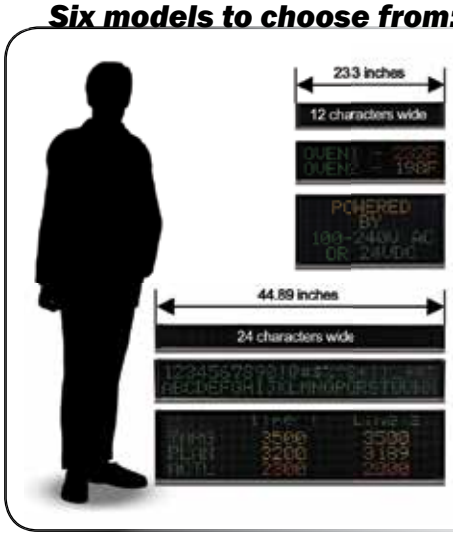

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Tech Thread

Pressure Switches

Pressure Switch Basics and Selection Tips

By George Tsakir,
AutomationDirect

Pressure switches are commonly used in a wide variety of industrial and commercial applications. To meet the varying demands of these applications, numerous pressure switch designs are available. The key to selecting the best pressure switch for your application is understanding the differences in pressure switch designs.

Sensing Technologies

A pressure switch is simply a device capable of detecting a pressure change and, at a predetermined pressure, opening or closing an electrical switch.

Pressure switches are usually classified as either electromechanical or solid state.

Electromechanical pressure switches have a sensing element which responds to changes in pressure and mechanically operates a snap-acting switch in response to the pressure changes. Different types of sensing technologies are used in the design of electromechanical pressure switches. Diaphragm switches use an elastomeric or weld-sealed metal diaphragm which deflects with pressure changes; they act directly, or via a push-rod, on a snap-acting switch.

With a bellows or bourdon tube switch, the movement of the bellows, or sealed metal bourdon tube, is caused by pressure changes; this movement mechanically operates a snap-acting switch.

A piston switch design uses an O-ring sealed piston that moves in response to pressure changes, and directly or via a push-rod, actuates the electrical snap-acting switch.

Solid state pressure switches use the same technology found in analog pressure transmitters to sense changes in pressure. A weld-sealed metal diaphragm or O-ring sealed ceramic diaphragm with a piezoresistive strain gage-based sensing element is used to measure changes in pressure. Rather than harnessing the energy of the pressure changes to mechanically operate a switch (as with electromechanical pressure switches), solid state pressure switches electrically measure pressure changes and internal electronic circuitry is used to activate one or more solid state switched outputs.

Ranges, Setpoint, & Deadband

Both electromechanical and solid state pressure switches are commonly available to sense vacuum, positive pressures up to thousands of psi, and compound ranges of vacuum to positive pressure.

The predetermined point at which the pressure switch contact opens or closes is the setpoint.

Electromechanical switches are typically available with a factory setting, or with a blind adjustment capability set by the user relative to an external pressure reference such as a pressure gauge or known pressure value.

Electromechanical switch setpoints can be set to activate upon an increased or decreased pressure. Solid state switch setpoints are set either by calibrated dials, knobs, or entered digitally with a keypad and display.

When selecting the pressure range for a pressure switch, a general rule is that electromechanical setpoints should be in the middle of the operating pressure range to optimize both accuracy and switch life. With a solid state pressure switch, selecting the setpoint in the upper 25% of the operating range will provide the most accurate performance without compromising switch life.

Deadband is the difference in pressure between the switch setpoint and reset point. For example, if a pressure switch is set to activate at 100 psi on an increasing pressure, the switch will close when the pressure rises to 100 psi. When the pressure drops to the reset point of 90 psi, the switch will open. The deadband is 10 psi, the difference between the setpoint (100 psi) and the reset point (90 psi).

For electromechanical pressure switches, deadband can be adjustable but is typically a fixed value, or automatically increases linearly as the setpoint is increased through the adjustable setpoint range.

For solid state switches, the deadband is typically fully adjustable up to 100% of the full operating pressure range. As a general rule a narrow deadband is used in alarm circuits while a wider deadband is better suited for control circuit applications.

Proof and Burst Pressures

Overpressure ratings include proof and burst pressure specifications. Proof pressure is the amount of overpressure that can be applied to the pressure switch without causing damage. The pressure switch can be exposed to pressure reaching the proof pressure rating, and be expected to work properly when the pressure returns to within the rated operating pressure range.

Burst pressure is the amount of overpressure applied at which the pressure switch will certainly be damaged. Physical damage to the pressure switch may occur at any point between the proof pressure and burst pressure. Because proof pressure ratings are determined in a laboratory under controlled conditions including rate of pressure change and temperature, they should be considered a reference value. It is not uncommon for pressure switches in the field to experience pressure surges and spikes that cause damage if a switch with too low of a proof pressure rating was selected. Typically solid state switches have lower proof pressure ratings and are most sensitive to overpressure conditions. Electromechanical switches with a diaphragm generally have higher overpressure ratings than solid state switches. Piston design switches have very high overpressure ratings and are the most reliable when subjected to pressure surges or spikes, and applications where the normal working pressure is above the nominal range of the switch. If pressure surges or spikes are anticipated in an application, a pressure switch with a high proof pressure should be selected to avoid damage.

Installation of a pressure snubber can also help to dampen the effects of fast pressure spikes on a pressure switch.

Accuracy (Repeatability)

For an electromechanical pressure switch with a factory set or user adjusted

Continued, p. 14>>

Mechanical Pressure Switches

at AutomationDirect prices

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The ProSense MPS25 series mechanical pressure switches are designed for the toughest applications where conventional pressure switch designs often don't measure up. These cost effective switches, depending on the pressure range, have either an all welded 316 stainless steel sealed diaphragm actuator design or a direct acting 316 stainless steel piston design with a Buna-N O-ring.

- Ranges available from -15 psi vacuum to 7,500 psi
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- Models with 6-foot embedded cable with 1/2-inch NPT conduit connection, or DIN form C electrical connection

These pressure switches are ideal for applications such as:

- Process control
- Pump and compressor control
- Pneumatic systems

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Tech Thread Cont.

Pressure Switches

Continued from, p. 12

ProSense Pressure Switch Selection Chart

ProSense		 
Specifications	**ProSense PSD25 Series - Solid State Pressure Switches**	**ProSense MPS25 Series - Electromechanical Pressure Switches**
Setpoint adjustment / Reset point adjustment	Calibrated mechanical dial / Calibrated mechanical dial	Mechanical adjustment (requires external pressure reference) / Fixed (increases linearly as setpoint is increased)
Adjustable setpoint ranges / Deadband	7.5 to 145 psi / 5 to 142 psi 75 to 1450 psi / 50 to 1420 psi 290 to 5800 psi / 175 to 5685 psi	-15 vacuum to +15 psi / 1 to 5 psi 6 to 30 psi / 1 to 5 psi 8 to 60 psi / 2 to 10 psi 10 to 100 psi / 3 to 15 psi 40 to 200 psi / 3 to 30 psi 50 to 500 psi / 20 to 100 psi 100 to 1000 psi / 25 to 150 psi 200 to 2000 psi / 30 to 300 psi 500 to 5000 psi / 75 to 750 psi 750 to 7500 psi / 110 to 1100 psi
Overpressure ratings (Range / Proof / Burst)	145 psi / 362 psi / 4350 psi 1450 psi / 2900 psi / 14500 psi 5800 psi / 8700 psi / 23200 psi	15 psi / 1000 psi / 9500 psi 30 psi / 1000 psi / 9500 psi 60 psi / 1000 psi / 9500 psi 100 psi / 1000 psi / 9500 psi 200 psi / 2000 psi / 10000 psi 500 psi / 8000 psi / 30000 psi 1000 psi / 8000 psi / 30000 psi 2000 psi / 8000 psi / 30000 psi 5000 psi / 15000 psi / 50000 psi 7500 psi / 15000 psi / 50000 psi
Accuracy	Setting accuracy: +/-2.5% of full range Repeatability: +/-0.5% of full range	Setting accuracy: Not applicable Repeatability: +/-2% of full range
Wetted parts	316 SS	Up to 100 psi: 316 SS 200 psi and greater: 316SS, Buna
Pressure connection	1/4" NPT Male	1/4" NPT Male
Cycle life	50 million	Diaphragm design: >400k Piston design: >1 million
Switch output	Transistor, DC PNP NO & NC, 500mA, 32 VDC	SPDT, 3A@120 VAC, 2A@30VDC
External power supply	9.6 to 32 VDC	None required
Electrical connection	M12 Quick Disconnect (cable purchased separately)	Integral 6 foot cable with 1/2" NPT male conduit connector or DIN Form C connector
Housing materials	316 SS, FPM, PC, PBT	316 SS
Housing protection rating	IP67	NEMA 6, IP67
Medium temperature	-25 to 80C	-40 to 100C (200 psi range -28 to 100C)
Agency approvals	UL, CE	UL (cable version only), CSA, CE
Warranty	3 years	3 years
Country of origin	Germany	USA
Sell price	**$89** (cable purchased separately)	**$89 w/ integral cable** **$82 w/ DIN connector**

Continued, p. 16>>

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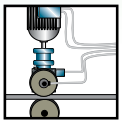

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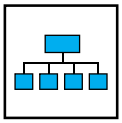

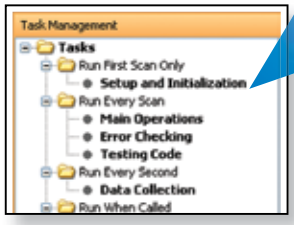

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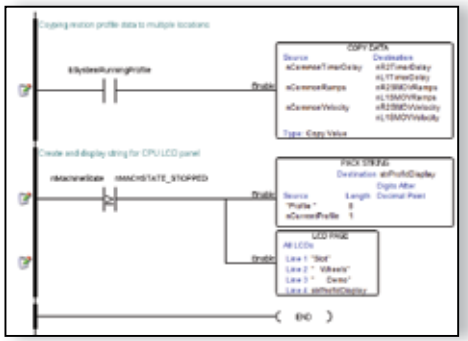

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Tech Thread Cont.

Pressure Switches

Continued from, p. 14

setpoint relative to a known pressure reference, accuracy is a measure of the switch's ability to repetitively operate at its adjusted setpoint under the same operating conditions. This is referred to as Repeatability in pressure switch specifications.

Because a solid state switch setpoint can be adjusted with calibrated dials, knobs, or a keypad and display, specifications will include both a setting accuracy value and a repeatability value. Pressure switches are typically available with accuracies from 0.25% to 2% and cost increases with accuracy. To avoid paying a premium for unnecessary accuracy, consider the needs of the application. An accuracy of 2% is probably sufficient for a simple alarming application, but controlling a critical process may call for a higher accuracy switch.

Chemical Compatibility

For both electromechanical and solid state pressure switches, determining the chemical compatibility of the pressure switch with the medium sensed is a critical element in the longevity of the pressure switch. Wetted parts are the parts of the pressure switch that actually come in direct contact with the medium being sensed, and their material composition is identified in pressure switch specifications. The wetted parts will include the pressure sensing port of the switch, the diaphragm, bellows, bourdon tube, or piston and any O-ring seals.

Chemical resistance charts and databases are readily available on the Internet and may be used to determine the compatibility of pressure switch wetted parts with the chemicals encountered in the measured medium.

A pressure switch with a brass pressure sensing port and elastomeric diaphragm (such as Buna N or Viton) may work well for some applications but will not last as long as a pressure switch with the chemical resistance of a weld-sealed stainless steel diaphragm and sensing port in many industrial applications.

Cycle Life and Cycle Rate

The number of times the pressure switch will be activated will have a direct impact on its longevity. Inherent in their design, electromechanical pressure switches have moving parts that are subject to fatigue affected by factors like magnitude of pressure changes and temperature. Diaphragm switches will typically provide >500k cycles. A piston design pressure switch can typically provide >1 million cycles and is more reliable than a diaphragm design when subjected to frequent large pressure excursions, pressure surges and spikes. With no moving parts, solid state pressure switch wear is reduced, typically allowing >50 million cycles.

The rate at which a pressure switch is cycled will also impact its longevity. An electromechanical pressure switch with a diaphragm works well for applications with a cycle rate of 25 per minute or less. Piston design mechanical switches are usually suitable for up to 50 cycles per minute. With no moving parts to wear out, a solid state switch should be selected for applications requiring rates that exceed 50 cycles per minute.

Electrical Characteristics

Electromechanical pressure switches harness the pressure of the medium being sensed to mechanically operate a snap-acting switch – no external power supply is required for the pressure switch to operate. Typically, electromechanical pressure switches are provided with SPDT or DPDT contacts rated for 3 to 15 amps and voltages from 120VAC to 480VAC. With solid state switches, an external power supply, usually 24VDC, is necessary to power the electronic circuitry inside the switch. The outputs of solid state switches are typically normally-open and normally-closed transistor switching outputs rated for about 500mA and 30VDC.

ProSense Pressure Switches

AutomationDirect offers our ProSense line of pressure switches which includes both solid state and electromechanical pressure switch designs. Our switches offer the specifications to meet many industrial and commercial applications and are all available for same day shipping. Use the following selection chart to help select the best ProSense pressure switch for your next application.

"The greatest power is often simple patience. "

– E. Joseph Cossman

"The difference between try and triumph is a little umph. "

– Anonymous

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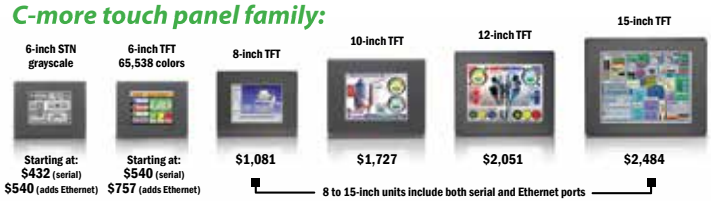

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Tech Brief

3D Drawings of AutomationDirect Products

How to Access AutomationDirect 3D Models

By Keri Schieber, AutomationDirect

AutomationDirect offers 3D models of their private label and brand label products, available on **TracePartsonline.net**, a provider of free CAD parts libraries.

To obtain 3D models for AutomationDirect products simply locate the product and download to your PC.

Locating the 3D Model

There are two methods for locating the 3D model part for download.

1. From the AutomationDirect store at the product level.
2. By searching the TraceParts Web site for the part.

3D Models via the AutomationDirect store

Step 1: Locate the part by going to the product level in the AutomationDirect store.

Step 2: Select the 3D Model link as shown. You will be directed to the 3D part on the TraceParts Web site.

3D Models via the TraceParts Web site

Step 1: Go to: **www.tracepartsonline.net** and select the Catalogs tab.

Step 2: Scroll down and select AutomationDirect.

Step 3: Select a preferred Display mode.

Step 4: Use any of several options for finding a Product Model. A few are listed here.

Option 1: Basic and Advanced Search

In order to search the entire AutomationDirect list of parts you must be at the AutomationDirect menu level.

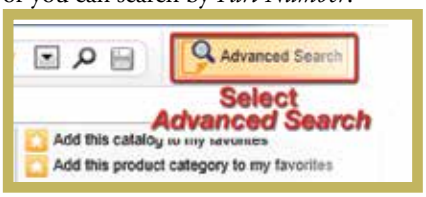
If at a lower level in the menu, the search will only look for results in the selected menu category.

Basic Search

To do a Basic Search, enter a part number and hit enter. The result will take you directly to the product model and download screen.

Advanced Search

Selecting *Advanced Search* will allow you to search by a *Title*, which does a keyword search of the product descriptions, or you can search by *Part Number*.



Option 2: Searching by Product Category

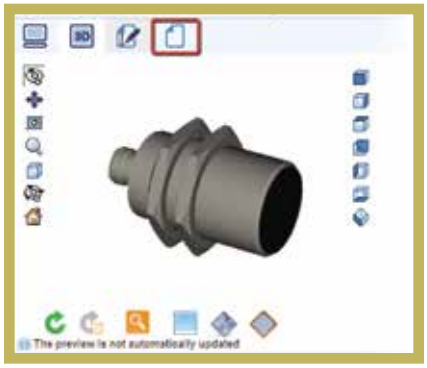
Searching by *Product Category* helps to narrow down the product list. While at the AutomationDirect main menu, select a Product Group, such as *Motor Controls*.

Select a part by browsing through the product list or select by using the Part number drop down list.

Viewing the Model

The default viewing on the Model page shows a photo of the product. To view the model, select the 3D icon as shown.

During preview, the model can be rotated and zoomed.

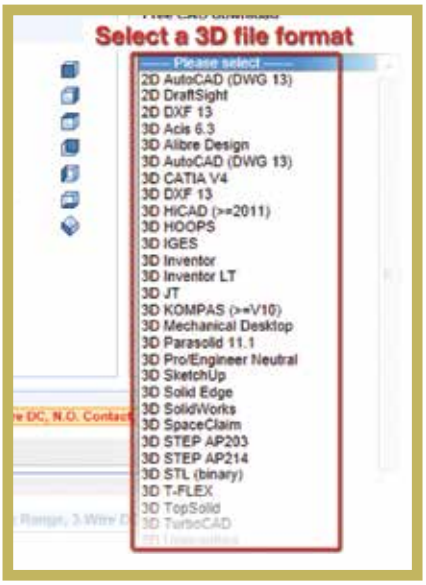


Additional information can be found by clicking Product Info after selecting the page icon as highlighted in red above.

This will redirect you to the AutomationDirect Web site for complete product information.

Downloading the 3D Model

Before downloading, a file type must be selected from the dropdown list. There are over 30 file formats to choose from.



Once the file type has been selected, there are two means for downloading; Direct Download (download only the current model) or Add to a Download Center (download multiple models).

In order to complete the download, a *User Account* is required. Once the user account is established, an email address and password must be entered to continue with the download.

For a *Direct Download*, the files are placed in your Temporary Internet Files directory. It is recommended to open the file and save to a permanent location.

When using the *Download Center*, files can be delivered by email or downloaded to the *Temporary Internet Files* directory.

You can place one model or multiple models in the Download Center. Selecting the *Download Center* tab will display a list of queued models. Select the envelope icon to have the models emailed, or select the green icon to have them downloaded.

Check back often for updates to the AutomationDirect 3D catalog at TraceParts as new models will continue to be added.

"I always wanted to be somebody, but now I realize I should have been more specific."

– Lily Tomlin

"As a child my family's menu consisted of two choices: take it or leave it."

– Buddy Hackett (1924–2003)

Student Spotlight

Manufacturing Solutions Center

Students help Manufacturing Center See AND Do More

By Chip McDaniel, AutomationDirect

When the mechatronics students at Catawba Valley Community College (CVCC) in Hickory, North Carolina, went looking for a suitable project to challenge their recently acquired PLC and HMI skills, they didn't have to go far. The college's Manufacturing Solutions Center (MSC) in nearby Conover needed a way to monitor the status of a large group of washing machines and dryers and display that information for the technicians who use them.

The Manufacturing Solutions Center performs a wide variety of product development, prototyping, engineering, marketing and contract testing procedures for companies across the country. They have considerable expertise with product development and rapid prototyping, including reverse engineering services, 3D modeling and printing, Laser scanning and cutting, CNC milling, and various forms of plastic molding. They offer training in LEAN manufacturing, supply chain management, and many other industrial related topics.

As an accredited ISO/IEC testing facility, they perform a wide variety of tests for the textile and garment industry. These tests include: antimicrobial testing, compression testing for textiles, defect analysis, fiber analysis, flammability testing, Formaldehyde/Phenol/pH testing, hosiery testing, lead testing, microscopy testing, physical testing, furniture testing, weathering/lightfastness testing, and Yarn/Fabric/Garment Analysis. For some of these tests, technicians often have to wash and dry various materials - sometimes repeatedly – in a lab filled with washers and dryers. These washing machines and dryers are in very high demand, and the technicians were having a difficult time keeping track of which machines were in use, and which were idle.

Jim Thomas, Mechatronics professor at CVCC, explains, "The challenge presented to the mechatronics students was to use off-the-shelf industrial automation components to determine the state of each of the machines in the 'wet lab' and to display that information clearly and concisely for the technicians, some of whom might be working in distant areas of the testing facility."

The students decided to limit themselves to "non-invasive" forms of monitoring as opposed to tapping into or altering the electronic control circuits built into the machines, such as the "cycle complete" lights or audible alarms built in to the washers or dryers. They were concerned that this would require long term support and maintenance whenever the washers and dryers needed to be replaced and/or upgraded.

The students experimented with both ProSense™ liquid flow switches and AcuAMP™ single phase AC current transducers from AutomationDirect. While the current transducers were the obvious choice for detecting the operating status of the dryers, the students had some concern that the washing machines would not draw enough current during certain

C-more touch panel in testing lab

Operator screen with status information

cycles (such as filling and soaking) to activate the transducers. It was thought that monitoring the water flow might also be required. But after thorough testing, the students were able to standardize on the analog current transducers for all the washers and dryers. The students were very grateful to the CVCC maintenance staff, who helped with the hardware installation.

One unexpected troubleshooting opportunity arose when a few of the dryers seemed to periodically stop drawing any current, while they were obviously still running. It was quickly deduced that once the dryers reached their temperature setpoints, the heating elements were cycling on and off to maintain the desired temperature.

As luck would have it with the two-phase input power, the current sensors on some of the dryers were monitoring the phase that also powered the motor (thus showing current draw throughout the entire cycle), while others were on the "heater only" phase, and would report the periodic on/off current flow. Simply moving the transducers over to monitor the other phase corrected the issue.

The signals from the current transducers are wired into analog input modules on an AutomationDirect Do-more PLC. The students were familiar with both the CLICK™ PLC and the Do-more™ PLC from previous PLC coursework. They chose Do-more primarily based on its Ethernet communications capability as well as its greater expandability for possible future enhancements. "The Do-more PLC was the obvious choice," reports design team member Cris Mura. "It's easy to program, has a handy, built-in simulator, and its Ethernet connectivity interfaces perfectly with the C-more HMI."

During the design phase of the project, the mechatronics team created a mock-up of a few HMI screens and presented them alongside some discrete multicolor indicator lights as possible notification options.

The MSC technicians had a clear preference for the C-more panel. The 12" C-more operator interface is mounted inside the wet lab for local use by the technicians, but the standout feature of the C-more HMI for this application is its "remote access" capability, because the technicians don't actually spend very much time in the wet lab. They only visit the lab in order to move the textile products in and out of the washers and dryers; many of them had resorted to wearing stopwatches around their necks as reminders to check on materials in the washers and dryers.

To take advantage of the C-more Remote Access capability, the students acquired two separate, low cost PCs, each with a 32" flat screen LCD monitor, which they mounted in two of the areas where technicians spend their time performing hands-on testing and other tasks. Now the technicians simply glance up at the screens to see the status of any washer and dryer being used for their tests.

These two PCs are equipped with large, easy-to-see screens networked to the C-more panel over Ethernet; both screens provide an exact copy of the information which is visible on the actual C-more device itself.

Tony Whitener, the Special Projects Director at MSC, is delighted with the solution, "We were so pleased with the collaboration between the continuing education students in the Mechatronics program, the educational outreach and technical support from Automation Direct, and our own in-house technicians and maintenance staff. All parties worked together seamlessly to produce a well thought-out monitoring system. It's a definite productivity enhancement for the Manufacturing Solution Center."

Now that the monitoring system is installed and operating, students are already thinking of enhancements. Cris Mura explains, "The C-more Remote App for iOS is one upgrade we are considering. Once the C-more is accessible from the MSC's wireless network, then anyone with an iPhone or iPad will be able to monitor the 'wet lab' status on their mobile device." The e-mail and text message features of C-more might even allow technicians to set-up custom text message alerts in the near future.

The student team is comprised of Derrick Artis, Brian Bowersox, Ben Burleson, Robert Fonnesu, Rusty Gabriel, Greg Harris, Stephen Lathrop, Cris Mura, and Josh Rudisill.

Jim Thomas, their instructor and the continuing education mechatronics program coordinator at Catawba Valley, was very complimentary about the students' efforts. "Tony and I discussed the project, presented it to the students, and after that I stepped back and let the students run the project. My involvement was purely an advisory role. They worked with the MSC technicians to define the requirements, debated several possible solutions, and presented their best ideas to the MSC staff to allow them to arrive at a final solution that would accommodate their preferences for the system operation. Then they designed and built the system and coordinated the installation with the CVCC maintenance staff. I'm proud of them not only for the great system they implemented, but also for the professional manner in which they achieved the project."

Visit **http://youtu.be/LiCGII-v0-g** to view a video of this automation system in action.

Learn more about CVCC here: **http://www.cvcc.edu** and the MSC here: **http://www.manufacturingsolutionscenter.org/**

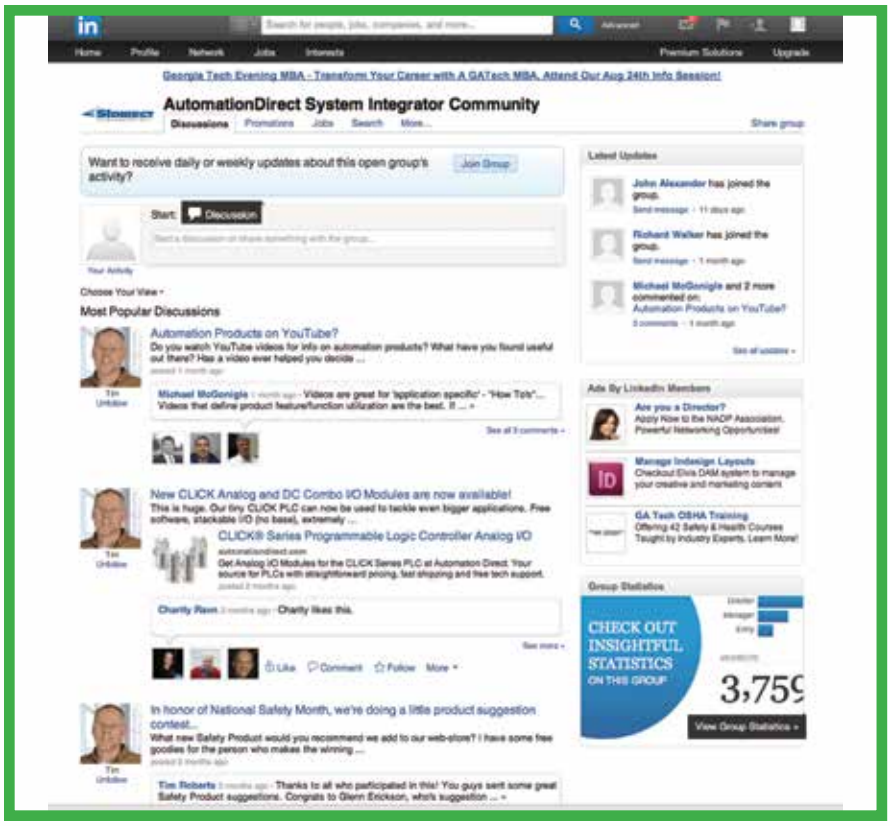
System Integrator Corner

SIDirect

Get LinkedIn with SIDirect

If you're not familiar with it, LinkedIn is an online professional networking site used by businesses and individuals for recruiting and networking purposes. LinkedIn is home to more than 200 million users in over 200 countries/territories. However, there is more to LinkedIn than just jobs and resumes; LinkedIn can help with your business needs, connect with peers, and more. LinkedIn has developed a very powerful connection engine which hosts all kinds of helpful conversations. This platform is known as LinkedIn Groups and users may join these groups to start discussions which matter to them. Of course the one group you need to be certain to join is the AutomationDirect System Integrator Community LinkedIn Group.

The AutomationDirect System Integrator Community LinkedIn Group is an ideal place to connect AutomationDirect integrators with each other and with potential customers in need of integration services. As of July 2013, the group included 74 members with several active discussion threads. While many in the group work for System Integrator firms (and several are members of the SI Direct Program), there are also members from a variety of industries.



The AutomationDirect System Integrator Community LinkedIn group has helped connect integrators to partner with each other, and connect members who need advice from or services of an integrator. For example, there was a discussion thread started by an end user who needed help measuring water volume in a vessel using mass, flow or pressure. On this thread, an integrator posted several suggestions with pros and cons to consider based on past experience with similar measurements and newer technology.

If you are an SI Direct member (or an integrator/designer), you need to join the group! If you're not an integrator, but might need to hire one—you need to join the group!

Join our AutomationDirect System Integrator community at: **www.linkd.in/YvU4wY**.

"Always remember that you are absolutely unique. Just like everyone else."

– Margaret Mead (1901–1978)

User Solutions

Do-more PLC

Switching to Do-more saves time

By Doug Armstrong

Almost 14 years ago, I converted the controls in my 80KW hydro-electric plant, located in the mountains of western North Carolina, from custom micro-controller cards I developed while at Georgia Tech to the ***Direct***LOGIC DL205 PLC with a D2-260 CPU.

In 2013, it was time to make some upgrades to the plant by adding features such as the ability to control the system over the Internet, improve monitoring, start data logging, and tighten up the code. After working with the Productivity3000 and CLICK series products, ***Direct***SOFT suddenly seemed painful when it came to working with floating numbers, more modular code, time synching, email imports into Google Docs, etc.

After reviewing my options, I decided to switch to the Do-more PLC using the H2-DM1E CPU.

Converting the old program

The first hurdle was converting the old code. The existing program controlled three hydroelectric turbines. The code worked with REAL numbers (metering) and had several stages for controlling each turbine and several more for sensor processing and HMI logic. This made for lots of similar looking code in one big file.

With some of the code, like reading analog to discrete modules, CTRIO cards, and Modbus devices, I knew the conversion would be intuitive with newer instructions, so deleting that code was not a factor.

As it turns out, the Do-more CPU supports most DL205 modules, so no work is required to get data into the PLC from any of those. The SCALE box makes analog to discrete data processing a snap. And the communications interfaces just work, no headaches there.

The problem was the control logic; proven and tweaked over years, I was not looking forward to the down time that would be spent recreating that.

About 90% of the ladder logic for this application was the same from the ***Direct***LOGIC program to the Do-more program, so I was able to start with that much code in the new system before making the necessary changes.

Most LD and OUT sequences were replaced by MOVE instructions and while it would be possible to use all "DL compatible memory", I also converted 90% of the data storage to the new 32-bit integer or floating point formats during the conversion. Any code I could not convert directly, I simply put in a comment block, disabled the rung, and rewrote with Do-more instructions.

Continued, p. 24>>

User Solutions Cont.

do-more PLC

Continued from, p. 23

Octal is a thing of the past

The Do-more PLC does away with Octal addressing. With the legacy PLCs, having to use OCTAL and BCD was difficult. With Do-more, this is fairly simple to fix. First, I imported my I/O point addresses into Do-more. I found this is best done via a spreadsheet because I/O point numbering is now in decimal. This means X10 (OCT) needs to be converted to X8 (DEC). While all the existing I/O modules still work, the I/O points are now numbered in decimal.

Another tip/great conversion tool was provided by Host Engineering: transfer DL compatible memory to a type called DLV (V2200 = DLV2200) (old = new system). This is not to be confused with new V/Variable memory, which reduces the complexity of indexed addressing by an order of magnitude.

Because my project uses some OptiMate operator interface panels that are supported by DLV memory, there was no need to reconfigure the keypads at all. Remote master devices now read the DLV block in the Do-more CPU; no porting required, just change the Vs to DLVs and you are done.

Stress less with Do-more math

The MOVE and MATH blocks in Do-more know all about strong typed memory (decimal and floating). All the old LD ten things on to the stack and then OUT them to memory are replaced by the MOVE (or a MathBox) instruction. This cleaned up tons of code and frees the program from needing to be stack-based or having to do base conversions.

The only issue is supporting older hardware; the TOBCD instruction simplifies this problem - it works just like MOVE but the result is a BCD number. For example, the new system stores water pressure as a REAL; to display this on the OptiMate panels in 16-bit BCD requires simply using the TOBCD instruction to convert the REAL number to BCD and store it in the display memory.

The new internal system structures in Do-more are object oriented. Accessing data like Time and Date is easy now referencing

the $Now structure. For example, $Now. Hour is the current hour. This makes code development fast and bug free. There are structures for everything, so for the most part the days of needing to know the special V register number to get system data are gone.

Where is my CTRIO Data?

Using the CTRIO modules is basically the same as in ***Direct***LOGIC. All local I/O modules are located by the Do-more CPU on power-up. They are all configured in Do-more. You can find them under PLC -> System Configuration. The Module Configuration submenu is where you can find your CTRIO card. I renamed mine to be RPM_CTRIO, and once you start to configure it, you will be in the familiar CTRIO configuration interface.

Each channel is named on the card; I called mine "Turbine#_RPM" (where # is 1,2,3). If you select a floating point result, the contacts looks like ($Turbine1_RPM. freg1 < 1790). Everything is context sensitive so as soon as you hit the "." the rest of the structure pops up. I got this part up and running in less than an hour.

Creating "programs" is like having a pool of processes in one box. This is very nice and provides excellent logic isolation. I put the control of each turbine in its own program, the HMI interface in another, System Logging in another, etc. To start a program you just use the RUN block and specify the program name and that process is enabled. Once in the program, additional features become available; for example, instead of using FirstScan, one can use the program structure to do things such as [program name].FirstRun or .FirstScan, allowing each program to behave like a unique PLC.

Data casting call

Data Casting is another tricky but powerful feature. In my DL260 system I was manipulating bit fields using the B1400.0 to hit bit 0 of V1400. Doing the conversion requires one to use DLV1400:0. In this case, I used the ***Direct***LOGIC compatible memory so my external devices should not need to be reconfigured.

Constants are another cool feature. Good programming practices suggest that using hard coded constants is a no-no since changing these requires knowledge of everywhere they are used. Do-more provides a way to name constants, which cleans up code nicely and eliminates having to store constants in pre-initialized memory.

Timers in Do-more are light years ahead of the old stuff. Timing from mS to Days is simple and uses just one timer type. In keeping with the structure's model, the new timers do away with archaic concepts like Tx and TAx or, Tx as the timer and Tx as a done bit. The new Timers support a Tx.Done or Tx.Acc. This is really nice since

it is easy to see the intent of the code and it is not necessary to create documentation for both the Tx and TAx items.

Network operations like time servers, email and string formatting are all nice, and help bring the DL205 hardware into the fold with modern PLCs. Note the documentation says most of these features only work on the built-in Ethernet port, although ECOM100 cards should still work for accessing other systems.

Other neat features are script processing and string handling. The STRPRINT box allows you to generate strings with embedded variables which can be used to send email messages etc. I did learn the hard way there are short strings SSx and long strings SLx.

Simulator and Trend monitoring

The Do-more system includes a simulator which is pretty cool. Even more valuable is the new trend monitoring. This is invaluable when you are doing PID work, but it can also monitor any system variable or state. It provides fantastic insight into how the system is actually running, and I used it to calibrate CTRIO constants, find bugs, you name it.

You do lose a serial port on the new cards. This is especially important if you are talking RS-485 on port 2. The good news is you pick up a USB interface to the PLC; this is nice if you don't have Ethernet in your plant. And you can always add more serial or Ethernet port modules.

Rock steady

The development system is remarkably stable. After 30 hours of use, it has remained rock solid. The documentation database can be a little slow sometimes making large changes (2-5 seconds), but otherwise is very solid.

So how do I feel about spending the $400 to upgrade? I decided I did not want to be behind the curve on the technology front and this was a good fit between the CLICK and Productivity3000 series, which I like a lot. After having made the investment, and been through the process, I see the CPU module as basically free. Code development is so much faster and cleaner, saving me hours. My productivity is way up, totally justifying the investment. And now I feel very confident using Do-more in future applications.

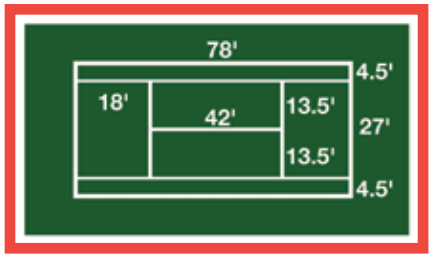
The Break Room

Brainteasers

Brainteasers

By Chip McDaniel,
AutomationDirect

1.) The 'bot is in Your Court



The local robotics team has come up with a robot designed to automatically paint the lines on a standard tennis court. The only issue with the robot is that turning the paint on and off makes a mess, but the team has realized that going over a line twice will work just fine. They don't want to waste any more paint than is absolutely necessary, so their challenge is to find a starting point and a route that will paint all the lines at least once, while minimizing the overall trip length. ***What would be the route (shortest distance) that the robot could take to paint the lines?***

2.) That Rhino Sure is Zippy

Otto went shopping at AutomationDirect.com for some supplies for his factory. He bought one Ziplink™ Module, two SureStep™ Stepping Motors, and three Rhino Encapsulated Power Supplies. He spent a total of $250 exactly (and he even got free shipping). But he lost his paperwork and forgot the prices of the three items (he also forgot that he could review all his purchase history, and even reprint past invoices on the Web store). All he could remember was that the price of three of the ZipLink modules plus one of the SureStep motors totaled exactly the same as the price of two of the Rhino Power Supplies. ***Can you help him figure out the actual prices of the three components?***

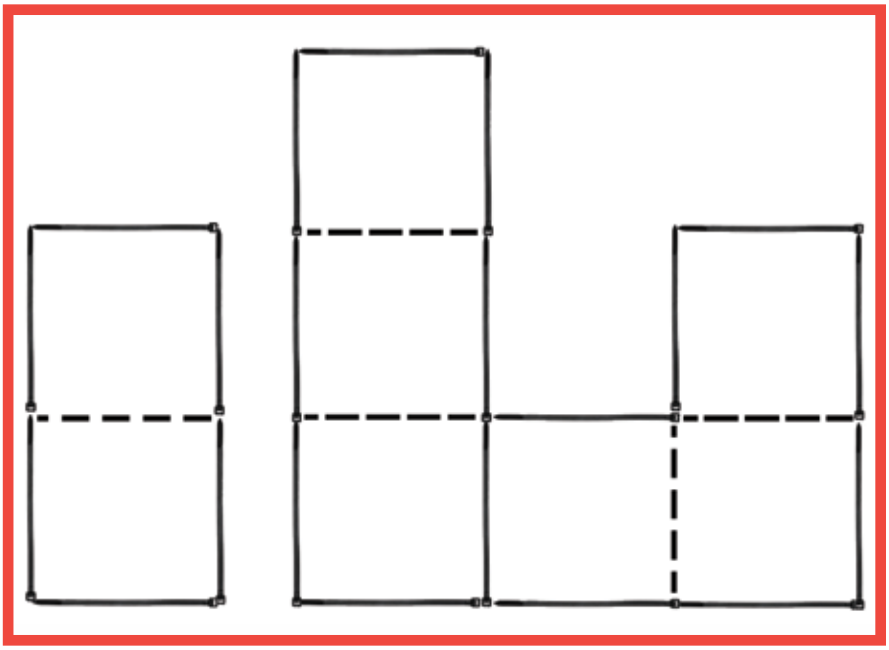
3.)Production Deduction

The shiny new automated machine in the puzzle factory produced one-fourth of the day's total production of puzzles before the morning break, then it produced one-fifth between the morning break and lunch. Another one-third of the total was produced between lunch and the afternoon break. After the afternoon break it produced 13 puzzles. ***What was the overall production total for the machine that day?***

4.) Cable Tie-up

With the cable tie layout shown, you might notice that the larger shape encloses exactly three times the area of the smaller. ***Can you move one cable tie from the larger group to the smaller, and still have the larger shape enclose exactly three times the area of the smaller?***

Remember, 12 of the cable ties must remain in their current positions, and no doubling-up the cable ties or loose ends, please. The dotted lines are shown only to help visualize the areas of the two shapes.



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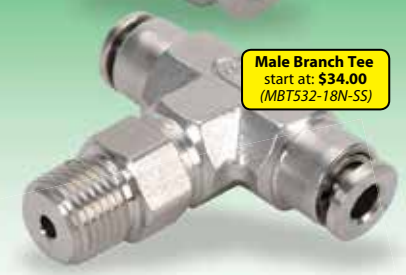

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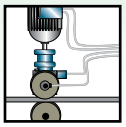

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