The most practical micro PLCs you can buy!

DL06 PLC starting at $199
- 20 inputs/16 outputs
- Expandable to 100 I/O
- Two communication ports
- Eight fill-in-the-blank PID loops with autotune
- Optional LCD display
- Built in real time clock/calendar
- Nine models available

DL05 PLC starting at $99
- Eight inputs/6 outputs
- Expandable to 30 I/O
- Two communication ports
- Four fill-in-the-blank PID loops with autotune
- Eight models available

Both the DL05 and DL06 feature:

Discrete on/off control
- AC/DC inputs/relay outputs (standard)
- Removable terminal blocks (standard)
- DC inputs/relay outputs

Analog control
- Seven analog input option cards
- PID with autotune (standard)
- Removable terminal blocks for easy wiring and setup

Communication and specialty modules
- Two serial communication ports
- Modbus master/slave (Part 2)
- Ethernet, DeviceNet, Profibus option cards
- High speed counter/pulse output module

Features:
- DC inputs/DC outputs
- DC inputs/relay outputs
- AC inputs/DC outputs
- AC inputs/relay outputs
- Option cards
- Ethernet, DeviceNet, Profibus
- High speed counter/pulse output

Table of Contents
New Product Focus 4
Molded Case Circuit Breakers 10
Product Snapshots 6
Non-fused disconnects, 17 mm and 30 mm pilot devices, ELCs, VAC 022 drives, ECT promises draw packages
Version 5.06, Signal Conditioners 12
Cover Story 8
PLC Drives Focused on Energy Conservation 13
Business Notes 11
User Spotlight 18
Holographic Technology, Replaces Conventional Operator Input Devices
Feature Story 13
Motion Control System Choices
Technology Brief 20
Improving Business Tools for Greater Customer Service
Tech Thread 22
A User’s Guide to Configuring Serial Ports for DirectLogic PLCs: Part Two
Technical Review 28
FYI 29
VFDs Frequently Asked Questions
The Break Room 30
Customer Service with a smile
New Product Focus

Electrical Protection

Units available in the MCCB line include the 100A G-Frame, 225A F-Frame, 400A K-Frame and 600A L-Frame. The G-Frame and F-Frame size units are suitable for reverse feed, and the K-Frame and L-Frame breakers include a 3-pole adjustable magnetic trip. All breakers include base mounting hardware for panel mount applications.

A line of accessories is also available for the MCCBs. Flex and standard shaft handles are available to make installing and operating the enclosure mounted MCCBs easy. Also available are multi-wire lug kits to save valuable panel space and wiring time by eliminating terminal blocks. Standard accessories, such as auxiliary contacts, shunt trips, and undervoltage releases are offered on all frame sizes. The line is manufactured in ISO 9000 certified facilities. Prices for the MCCBs start at $139.

End of text.
Non-fused disconnects

Cumming, GA—April 15, 2005 — AutomationDirect has introduced a line of non-fused switch disconnects for breaking and disconnecting on equipment loads. The SD1 series non-fused disconnects allow breaking and disconnecting on equipment loads of up to 600 VAC, at a nominal current range from 16 A to 40 A. SD2 series non-fused disconnects allow breaking and disconnecting on equipment loads of up to 600 VAC, at a nominal current range from 63 A to 125 A.

Both models are DIN rail or panel-mountable and feature high breaking capacity (AC 22 A to AC 23 A), double break contact, high electrical and mechanical endurance, and are resistant to damp heat. The non-fused disconnects have an IP20 degree of protection and are HACR rated.

Prices for the non-fused disconnects start at $19. A complete line of standard accessories is also available, including an optional auxiliary contact module (one N.O. and one N.C. contact).

New 22 mm and 30 mm pilot devices available

Cumming, GA—April 15, 2005 — AutomationDirect has extended their 22 mm and 30 mm pushbutton product offering to include several non-illuminated and illuminated models. New 22 mm models are available in plastic or metal designs. Plastic models include several choices of push-on / push-off configurations. Metal pushbutton models with LED indicating lights are available in either extended operator or mushroom operator designs, rated for 24 VDC/VAC or 120 VDC/VAC voltages. Also available for the 22 mm metal line are potentiometers and audible buzzers with LED indication. New Cutler Hammer 30 mm models feature an illuminated蘑菇 operator designs, rated for 115V and 230V supplies. 

New 30 mm models are available in plastic or metal designs. Plastic models include several choices of push-on / push-off configurations. Metal pushbutton models with LED indicating lights are available in either extended operator or mushroom operator designs, rated for 115V and 230V supplies.

Prices for the new 30 mm models start at $22. A complete line of standard accessories is also available, including an optional auxiliary contact module (one N.O. and one N.C. contact).

UPDATE—ECT promises new draw packages Version 5.06 now available

Cumming, GA—April 15, 2005 — ECT promises new draw packages for easier installation and maintenance. A line of accessories rounds out the offering.

115 VAC GS2 drives added to line

Cumming, GA—April 15, 2005 — AutomationDirect has added three new models to the GS2 series of AC drives. The 0.25 hp, 0.5 hp and 1.0 hp drives have a 115V single phase input and a 230V three phase output. These 115V drives can easily be used in environments where a 230V supply is not available and in such applications as fans, pumps, and general motor control.

Prices for the 115 VAC GS2 drives start at $19. A complete line of standard accessories is also available, including an optional auxiliary contact module (one N.O. and one N.C. contact).

Software for operation. All promise AutoCAD add-on packages, such as FC-DRAW-STD and FC-DRAW-PLUS-STD, now support AutoCAD and AutoCAD LT. 2000/2002 (version 5.05) and 2004/2005 (version 5.06). The packages start at $995.

New Product Request

AutomationDirect is actively adding new products so it can become your one-stop shop for industrial automation components. We welcome your input; we recently introduced wire duct and non-metal enclosures largely in response to customer requests.

If you have suggestions, please feel free to jot down the info requested below and fax to 770-844-4212. Or, use the “Suggest a Product” link online at the bottom of our “Contact Us” page at www.automationdirect.com (if you need to review our current product offering, the best way to do it is to visit www.automationdirect.com and click on the Site Map link at the bottom of the home page.)

Product Request

Name ___________________________
Company ___________________________
Type of Business: End-user OEM Integrator Other ___________________________

Product Suggestions:

__________________________________________
__________________________________________
__________________________________________

Contact Us

If you have suggestions, please feel free to jot down the info requested below and fax to 770-844-4212. Or, use the “Suggest a Product” link online at the bottom of our “Contact Us” page at www.automationdirect.com (if you need to review our current product offering, the best way to do it is to visit www.automationdirect.com and click on the Site Map link at the bottom of the home page.)

Product Suggestions:

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Automation Notebook | Spring 2005 Issue Four
AC Drives Focused on Energy Conservation
by Russ Sanders, Guest Writer

Today, energy conservation and cost-cutting solutions have become a major focus in the manufacturing sector. Fossil fuel costs continue to increase and the extreme growth in China is contributing to rising costs in other areas of goods, including steel and coal. Managers of manufacturing facilities are faced with many questions regarding energy conservation and efficiency. They are evaluating what is viable for their facility. Periodic reviews of soaring costs are necessary to stay competitive as implementation of new processes can be expensive. That’s where today’s more energy efficient AC drives can help.

Historically, manufacturers of drives have been able to differentiate their product offerings from those of their fellow competitors on a combination of price, performance, quality, and service. As the market has matured, drive prices have continued to decrease, the performance gap has narrowed, and the level of quality has increased. AC drives have almost become commodities; however, there are still areas where drive manufacturers can add value to their products and differentiate their products from their competitors. In addition to energy efficiency and cost, other notable areas are power quality, ease of use, size, and integration functionality.

AC drives, sometimes called variable frequency drives, are primarily installed for either improvement in energy efficiency or for better control of industrial processes. In each type of installation, users must decide which manufacturer’s model offers the desired mix of characteristics for cost, performance, precision, environmental impact, ease of use, communications, interface, installation, and size.

Typical industrial applications for AC drives include extruders, centrifuges, presses, pumps, conveyors, material handling, and cranes. The AC drive’s ability to reliably control speed and therefore torque is critical. Not only must the drive provide precise control of its load, it must also operate for extended periods of time. Many applications requiring 24-hour operation. The primary evaluation criteria for AC drives in industrial applications have typically centered on reliability and performance. Initial cost is usually a secondary consideration, limited to the AC drives that have met the initial performance requirements.

Energy Savings

As energy costs continue to rise, the savings from the use of drives becomes even more significant. Electric motors consume approximately half of all the electricity used in the United States. Motors controlled by AC drives are among the most efficient of all types of motors in use. Therefore, widespread use of AC drives in industrial, HVAC, and similar applications can help reduce current levels of energy consumption.

In applications designed with energy efficiency in mind, AC drives are used to control the speed of devices such as blowers, fans, pumps and chillers. The primary objective in these applications is the reduction of energy usage, measured over a predefined period of time. Typical peak periods as short as 12 months or even a year are used to justify the purchase of an AC drive system. In some cases, the energy savings can pay for the AC drive and installation in even less time. Of course, payback periods and the amount of savings will vary with the application. Typically, all motors must be sized for the worst-case scenario, often the starting of the device. Once running, the motor no longer requires the same amount of current to keep running, but without an AC drive in the system, most motors will continue to draw unnecessarily high current levels. With an AC drive operating the motor, the drive adjusts the current levels automatically to meet the demands of the application. Additional savings are also possible during lower demand cycles, as the motor speed can be reduced, which in turn reduces the energy used during those low load conditions.

One promising mainstream application in this category is the use of sub-micro drives on residential HVAC units. As the cost of drives continues to fall and the potential energy savings continue to increase, this application should become more common. The compressor pump motor and the condenser fan motor on a residential air conditioner each require a high start-up current. Once up to speed, the efficiency of both motors can be improved if they are controlled by drives.

Under drive control, these motors can also operate very efficiently at slower speeds on certain days, based on the temperature differential between the indoor and outdoor environments. Though the immediate and primary impact from applying an AC drive is the reduction in energy costs, the introduction of the AC drive into the installation must not affect reliability. For this reason, redundant systems, as well as bypass options and mechanical flow control, are often installed.

Power Quality

There are many compelling reasons to implement AC drives. However, due to their consumption of non-sinusoidal current and power quality problems, AC drives are considered commodities. This concept is strengthened by the fact that only minor differences exist between the AC drives of different manufacturers.

Thus it becomes increasingly difficult for manufacturers to differentiate their products from their competitors. AC drives can cause power quality and interference problems that may affect nearby electrical equipment. When an AC drive is used, the power input side (front end) of the drive can change the power quality at the input to the drive. This can be accommodated through:

- Keyed displays with increased complexity - larger display size, greater number of keys, graphical displays, and user-defined keys.
- Hierarchical parameter structure - with advanced, complex functions hidden from the average user.
- More intuitive parameter descriptions and error messages that allow customization with the drive in plain English.

Shrinking cost and size

AC drives will continue to become smaller and cheaper. Three major factors will be responsible for the continuation of this trend:

- The reliability, performance, and cost of electronic power components continue to improve.
- Successive generations of microprocessors continue to offer higher levels of performance and reduced cost.
- The manufacture of these drives continues to migrate to offshore countries (such as China), which have the capability to produce high-quality, compact products at substantially lower costs.

Integrated functionality

In addition to connecting to the AC power system and the motor, an AC drive must also interface with external devices such as PLCs, limit switches, push buttons, potentiometers, etc. In order to connect to these auxiliary devices, an AC drive typically provides a number of both digital and analog I/O connections. Because of the flexibility inherent in microprocessor-based design, these inputs and outputs can usually be configured to perform many different functions.

This flexibility allows an off-the-shelf product to be custom tailored to each individual application. In many instances, the need for specialized function cards is eliminated due to the additional functionality present in the AC drive. The following are a few areas in which manufacturers will continue to add integrated functionality to their products:

- Manufacturers will continue to add programmable functionality, perhaps even offering the functional equivalent of an embedded PLC.
- With more emphasis placed on ease of use, the user interface will be further simplified. Manufacturers have already begun replacing simple alphanumeric keyboards with “real” language LCD-based models.
- Remote mounting of the keypad is also now possible with some models.
IPLC, I/O and PC-Controls Group
AutomationDirect Product Manager by Jeff Payne,
Evolving basic sequencing functions of earlier models. With high resolution, it opened the door for the PLC to perform much more than the relay logic replacement they were designed to be in the late 1960’s.

As the PLC has evolved, we have seen its intelligence grow too. In the early 1970’s, the PLC became capable of communicating to other devices. The introduction of MODBUS communications protocol by Modicon was the beginning of many new responsibilities for the PLC because MODBUS allowed communications among PLCs over standard cabling. This allowed the PLC to be placed in closer proximity to the real world devices and communicate back to the system controls in the main panel.

The communications craze has spread far and wide. In the past 30 years we have seen literally hundreds of proprietary and standard protocols developed, each with their own unique advantages. It is fast becoming the responsibility of the PLC to be the information superstar of the process communications conglomeration.

Today’s PLCs have to be data compilers and information gateways. They must interface to bar code scanners, printers, temperature and analog sensors, and more. They need multiple protocol support to be able to connect with other devices in the process. Furthermore, they need all of these capabilities while remaining simple to program, easy to edit, and allowing you to remain within your budget.

By expanding the controls beyond discrete I/O, we have opened the door for the PLC to perform much more than the basic sequencing functions of earlier models. With high resolution analog modules, most PLCs are capable of computing complex PID algorithms, including Auto-Tune capabilities. The PLC is now well equipped to replace standalone process controllers in many applications.

Whether it is reading a temperature, pulling a heater element with a time-proportioning control output, or reading a 4-20mA pressure transducer for modulating a control value to adjust the hydraulic pressure in a system, today’s PLCs are up to the task.

One of the most recent responsibilities the PLC has been tasked with is simple motion control. These applications require accurate control at a fast pace, without expecting exact precision and blazing speed. These are applications where the PLCs work well. Most any nano and micro PLCs are now available with high speed counting capabilities and high frequency pulse outputs built into the controller, making them a viable solution for open-loop control.

Despite being a relatively simple, less than ideal form of control, open-loop control alternatives are still a growing part of industrial applications. What makes this different from other types of motion control is that the controller does not know the position of the output device during the control sequence. So why even consider this as an option when designing your process application? Simple – cost.

This type of control is no stranger to the process world, but in the past it has required an expensive option module, and at times has been restricted to the more sophisticated control platforms in order to achieve system requirements.

Positioning applications are probably the most common open-loop processes because a stepper is a position-based no-feedback device (it will drive at full force to get to commanded position, or fail trying) vs a servo that closes its position loop, and will vary its output torque to get into/hold at commanded position.

Consider the following applications -
- cut-to-length
- indexing tables or conveyors
- x/y tables (plotter/cutter)

These are only a few examples of what you can easily accomplish with a low cost PLC and stepper system.

So how is the PLC accomplishing these new market requirements? The modern PLC has incorporated many types of Commercial off the Shelf (COTS) technology into its CPU. Taking advantage of the latest technology gives the PLC a faster, more powerful processor and more available memory at less cost.

These advances in technology have allowed the PLC to be much more than the relay logic replacement they were designed to be in the late 1960’s.

Today’s Programmable Logic Controllers (PLCs) have to be much more than the relay logic replacement they were designed to be in the late 1960’s.

Today’s Programmable Logic Controllers (PLCs) have to be much more than the relay logic replacement they were designed to be in the late 1960’s. With high resolution, it opened the door for the PLC to perform much more than the relay logic replacement they were designed to be in the late 1960’s.

In our fast paced and economically stressed industrial world, flexibility is becoming a higher priority for those who are specifying automation systems. Users need multi-functional control, simple connectivity and easy access to process data, all wrapped up in a nice neat package.

Today’s Programmable Logic Controllers (PLCs) have to be much more than the relay logic replacement they were designed to be in the late 1960’s. With high resolution, it opened the door for the PLC to perform much more than the relay logic replacement they were designed to be in the late 1960’s.
Holographic Technology Replaces Conventional Operator Input Devices

In April 2002, HoloTouch, Inc., a Delaware corporation with offices in Darien, Connecticut, announced that its founder and President, R. Douglas McPheters, had been granted a U.S. Patent for his "holographic control arrangements.” This innovative technology allows operators to actuate and control a wide variety of electronic devices by simply passing fingers through colorful, three-dimensional holographic images floating in the air at a location convenient to the user. Utilizing well-developed wave source technologies, an infra-red detector or laser scans the plane of the holographic images, detecting the intrusion of a finger into the defined area of the images, identifies which number or symbol has been selected and transmits the selection to the equipment's internal software, much the same way pressing a button on any ordinary keypad would (see Figure 1). Interestingly, this basic technology was envisioned by McPheters while writing a thriller as yet unpublished about a Manhattan lawyer who participates in a loan-sharking operation in what’s left of the Soviet Union.

HoloTouch solves many problems inherent in conventional tactile keyboards and keyboards, particularly those regularly subject to contaminants, dirt, moisture, temperature fluctuations and shock. The easy-to-use interfaces can provide reliable operation of equipment where conventional tactile interface sizes have shrank below normal finger size. There is no wear with repeated operation because HoloTouch interfaces have no moving parts to fail under normal or even heavy use. Because there’s nothing to physically touch when using HoloTouch, healthcare personnel can gain direct, reliable control of operating room equipment; where actuation and control must be indirect because computer keyboards cannot be effectively sterilized (see Figure 2). Further, contrary to many new technologies, HoloTouch interfaces are cost-effective, both initially and over time.

One of the first products using HoloTouch technology has been created by Atlanta-based Corporation. The two companies recently announced that their fully functional touchless holographic interface, BeamOne ([www.holode.com](http://www.holode.com)), won a 2004 Control Engineering Editors’ Choice Award as “among the most significant innovations featured in Control Engineering during the past year.” BeamOne (see Figure 3), is seen by PCs as a keyboard and allows operators to control equipment by simply passing a finger through holographic images of "keys" floating in the air. The 1-inch square holographic "keys" are projected several inches in front of the hardware. Power and communications are provided by the PC's USB port and sensors in BeamOne detect an operator’s interaction with the holographic images operating as a simple 4-button keypad. The BeamOne product has already been purchased by several large automakers to evaluate for use in their products and production facilities.

Motion Control System Choices

Motion control is generally understood to mean the use of servo and/or stepper systems as the “muscles” to move a given load. Motor and drive systems, such as variable frequency drives (VFD's) with AC motors, can be controlled by a PLC. These systems are typically used for providing speed control, where motion control systems are capable of extremely precise position control as well as velocity and torque control. Applications which require positioning of product, synchronization of separate elements, or rapid start/stop motion are all perfect candidates for the use of motion control. PLCs are very capable of providing the signals required to command these servo and stepper systems in a cost-effective and digital (noise-free) manner.

In a typical motion control system there are three basic components: the controller, the drive or the controller with specific details about the actual movement of the motor shaft or the load. This feedback data is used to increase the accuracy of the motion, and can be used to compensate for dynamic changes that may occur at the load, such as changes in mass, friction, or other disturbances. Servo systems operate in a closed-loop fashion while stepper systems provide open-loop control of position. The choice between open-loop versus closed-loop control depends on many factors and both are useful methods for controlling motion. PLC-based controllers can be used for either type of system.

Types of Industrial Motion Controllers

Historically, there have been three basic types of controllers used for motion systems: standalone controllers, PC-based controllers, and PLCs. Standalone motion controllers are usually dedicated devices or option cards that are purpose-built for motion applications. They are typically very good at controlling motion, but most are expensive, sometimes difficult to integrate into the overall machine control system, and may use analog or proprietary signals for communication with the drives. Programming languages are often proprietary and may require high-level engineering assistance for basic troubleshooting and programming changes. Standalone controllers are usually sold based on an axis count with 2, 4, 8 and even 16 axes of control being common. Tight coordination between multiple axes of motion is possible with these controllers.

PC-based motion controllers are a more recent option. These controllers have evolved from the standalone controllers, and have both advantages and disadvantages. PC-based controllers can handle high axis count applications with requirements for tight coordination between axes and usually benefit from the extensive communication options available on a PC platform. PC-based motion control can also be integrated with PC-based logic control and HMI software, often running on the same hardware platform for integrated “single box” control for a machine. But PC-based motion is also expensive and suffers from ease-of-use and maintenance issues, with motion control code often written in proprietary or complex programming languages. Some PC-based controllers are nothing more than standalone controllers that happen to fit inside the PC. These motion control “cards” use the PC bus for communication and power, but they are still proprietary controllers with a motion specific circuitry, which do not usually utilize the processing power of the PC.

In a typical PLC-based motion control system, high-speed pulse output cards are used in the PLC to generate a ‘pulse train’ for each servo or stepper drive. The drive receives the pulses and indexes the motor shaft by a preset amount for each pulse. Typical stepper systems might index 1/200 of a revolution per pulse, while micro-stepping or servo systems might be configured as little as 1/10,000 of a resolution for each incoming pulse. The amount of motion dictated by a single pulse can be adjusted in the drive to accommodate the maximum pulse output frequency from the PLC. A separate signal is used to determine the direction of travel. A similar but functionally equivalent method, clockwise/counterclockwise, uses a separate pulse train for the direction of travel. This method is somewhat less popular, but has advantages in some applications. Electronic gearing can also be used in the drive to allow high-resolution moves at low speeds, as well as a high speed mode for faster moves with lower resolution.
Encoder feedback, when used, is normally handled at the drive level. Two simple hardwired signals from the drive back to the PLC—drive fault and in-position—are often used to notify the PLC of exceptions and/or completion of each move.

**Early methods of motion control**

Electric motion control systems originated as alternatives to hydraulic motion systems. With most electric systems ranging in size from a few watts into the kilowatt range, electric motion control has become prevalent at these smaller sizes, while hydraulic systems continue to dominate the larger applications approximately 5 kW and above, where electric power is impractical or unavailable and where the environment is harsh or extreme. The electric systems are more factory-friendly, less obtrusive, and are easier to install than the plumbing required by hydraulics. Early electric servo systems were usually operated in velocity or torque mode, accepted analog command signals, and were quite successful despite problems with electrical noise and drift. Early PLC-based controllers used analog output cards to provide the velocity or torque command signals.

Motion control systems have allowed machine builders to move away from line shaft driven machines, where all motion was passed back to a single large motor or line shaft. Gears, chains, cams, and pushrods were employed to create all of the desired motions at each point on the machine. While these mechanical associations worked well, they weren’t very flexible and often required changing parts for different sizes and types of products. Spare gears with different numbers of teeth and various mechanical carts with different shapes were required to perform a change-over for different sizes of product or machine configurations. The time required to complete the change-over was also an issue, with lengthy downtime required for maintenance personnel to complete the changes. Once the mechanical change-over was complete, the machines could require a lengthy adjustment period until the new set-up was optimized.

More recent motion control technology enables the concept of software-based change-over. With each motion on a machine controlled by a separate motor, new motion control parameters can be quickly, simultaneously, converging the machine to a saved configuration without having to replace mechanical components.

**Modern motion control technology**

One beneficial technology for modern motion control is the permanent-magnet brushless motor. The old brush-type motors were less efficient, and required brush replacements at regular intervals. Advancements in magnet technology have enabled the design of compact, powerful motors, whose rotors require no electrical connections (or brushes). Virtually all modern motion control systems, both servo and stepper-based, now employ brushless motor technology.

While analog control signals are still used on some systems, modern motion systems have migrated to some form of digital control. The advent of the digital servo drive, with the ability to close the position loop, was another major step forward. New types of signals between the controller and drive are now required to send position commands to these digital servo drives.

The three most common control signals used by today’s PLC-based motion controllers are the pulse and direction signals detailed earlier, discrete signals to an intelligent or indexing drive, and fieldbus communications. The pulse and direction interface that was originally developed for stepper systems has now become a standard feature on most servo products as well. A PLC with a high-speed output is unquestionably the most cost effective method for controlling motion today. No intelligence is required in the drive and all programming is performed in the PLC. All of the PLC’s control, available from AutomationDirect offer some form of high-speed pulse output. Even the DL05, AutomationDirect’s $99 PLC, includes a single 70KHz high-speed output which can be used for limited motion control applications. The DL05 will also accept an optional H-CTRLIO module which provides an additional high-speed output channel at up to 25kHz. The AutomationDirect SureStep stepper motor drive, and required DC power supply start at $267 for a single axis of motion, and can easily be controlled by the DL05. In addition to the benefit of a low price, all motion and logic instructions are programmed in the DirectSOFT programming software for significant time savings.

Indexing drives offer another two options for PLC-based control. Indexing drives are a combination of a standalone controller built in to the sever or stepper drive. These single-axis devices have I/O capability, and can execute motion profiles based on a single PLC or real world input. This type of drive often includes a fieldbus connection and can perform moves based on commands and parameters received across such a connection.

The new SureServo line of servo products from AutomationDirect (available summer 2005) are indexing drives. The SureServo drives can be pre-programmed with parameters for up to 8 separate motion profiles, which can then be initiated via discrete inputs from a PLC or signals from other devices, even pushbuttons. These moves can consist of precise, user defined accelerations (ramps) to preset speeds, with accurate decelerations carefully timed to end predefined positions.

Dynamic velocities (with controlled ramps) and precise application of torque are also possible. Parameters for vibration suppression (notch filters), load inertia range, proportional and integral gain, and many others can also be customized for specific applications in the SureServo drive. The SureServo offers two adaptive auto-tuning modes, which continue to tune the system while it operates.

The SureServo products also have a built-in MODBUS interface. MODBUS enables controllers, including PLCs, to initiate moves and download parameters to the SureServo drive across the MODBUS link. The MODBUS link can also supply information back to the controller about the performance and status of the servo motor and drive system. Multiple SureServo systems can be controlled via a single MODBUS port on the PLC. The SureServo’s ability to download custom motion profiles from a PLC on the fly, and execute these moves on command, allows the ultimate in flexibility and control with a PLC based motion controller.

**The future of PLC based motion control**

While it is difficult to predict the future, AutomationDirect is always interested in the enhancements and features that our customers are requesting. Features that are frequently requested are higher speed output cards for our PLCs, easier to use configuration software, and high level function blocks in the ladder programming environment. The current high-speed CRT/O modules offered by AutomationDirect have a maximum output frequency of 25kHz. While this is sufficient to command motion at high speed (4500 RPM at roughly 330 pulses per revolution), or high resolution (8000 pulses per revolution, up to 375 RPM), users are asking for outputs that would allow both high speed and high resolution without any trade-off.

Software is playing a bigger role in the evolution of PLC specialty modules for both discrete and hybrid control applications. Advancements in small footprint microprocessors and the acceptance of flash ROM memory, combined with software that provides intuitive graphical configuration, are eliminating the need for large amounts of setup logic often needed in the beginning of the PLC user program. These new breeds of specialty modules, such as high-speed output cards or motion control modules, are becoming more common and provide substantial time savings for programmers and maintenance personnel. With these advancements in PLC technology, PLCs will continue to meet the needs of machine control applications. They will stay more cost-effective and easier to use than PC technology, or separate logic and motion platforms, and will do so in a much smaller package.
AUTOMATIONDIRECT now carries a wide range of circuit protection and motor control components for your electrical systems. We offer Fuji Electric’s DUO and Odyssey series motor control solutions, with over 250 parts in sizes up to 300 hp (at 480 VAC). The molded case circuit breakers and supplementary protectors give you high-quality, reliable circuit protection. These and all the products shown here are in stock and available for same-day shipping at our everyday low prices.

**Contactors**

Load switching up to 300hp
- 1/2 to 300hp
- Compact frame sizes from 45 mm up to 366 mm
- Fuji Super NG-34™ technology employed on the larger contactors for greater reliability
- 24 VDC, 24 VAC, 120 VAC, and 240 VAC coils

**Manual Motor Starters**

10A FLA
- IEC 105A, 110-120VAC/DC coil

25A FLA
- IEC 25A, 110-120VAC coil

65A FLA
- IEC 65A, 110-120VAC coil

**Price**

$319 $1,650

$39 $94

$319 $1,650

$39 $94

$319 $1,650

$39 $94

**A sample of parts and prices**

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</tbody>
</table>

**Traditional Starters**

(Contactor + Thermal overload relay)

Thermal overload relays
- Can be used with 1/2 to 300hp contactors
- Overload, open phase protection
- Ambient temperature compensation

**Combination starters**

(Contactor + Manual motor starter (MMS))

Manual motor starters (MMS)
- Can be used with 1/2 to 40hp contactors
- UL508 listed group motor ratingfriendly
- Circuit breaker functions plus overload relay functions in a highly compact unit
- Two-frame sizes up to 60 amps
- Up to 50 kA breaking capacity at 480 VAC
- Rotary actuator
- Manual/GNUH control with lockout capability
- Trip-free design

**Control Power Transformers**

Starting at $39
- 100 to 500 continuous VA models
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- SD2 series disconnects loads at nominal current range 63-125A

Visit www.automationdirect.com/motorcontrols for more information on our complete line of motor control products.
Improving Business Tools for Greater Customer Service

By Dave Hartig and the Communications Team

AutomationDirect

n today’s competitive market, companies are always looking for ways to set themselves apart. The companies that truly succeed are those who continually deliver exceptional service and support while providing competitive prices. At AutomationDirect, we strive at being the best in all of these areas.

To continue providing world class service and support to our customers, AutomationDirect has made three major technology improvements within the company this past year. Although all improvements were successful, there were some unexpected glitches along the way, some of which our customers experienced.

Updating our Helpdesk

The first system upgrade implemented was in the spring of 2004. The technical support team had been using a small Helpdesk system that was rapidly becoming less and less efficient. With more products to support, the volume of calls was increasing. The existing system, which used an Access database, was struggling to keep up with all the data entries, report requests, etc. There was a need for more advanced features for tracking customer concerns, product issues and more.

After careful consideration and research, the selection was made for a new technical support helpdesk product - HEAT (Helpdesk Expert Automation Tool). HEAT allowed us to move from the Access database to a SQL server database for greater reliability, performance and functionality. The software is customizable, allowing us to meet specific needs of individual departments and users. One key feature is the ability to do reporting using almost any database query/reporting tool. HEAT also allows our Customer Response Assistants (CRA) to quickly assign calls to the right tech person based on their expertise in a particular product. This is a major benefit in efficiently serving a customer by quickly routing them to the product expert.

HEAT also has a tool that automatically notifies a tech person when a new call is assigned to him. It tracks all aspects of a call, including part numbers, serial numbers, problem description, problem solution and other actions to assist the tech person in serving his customer. This information is also useful for tracking any trends in product problems. HEAT has allowed us to respond quickly to our customers who call with technical support issues and is a key in successful communication. AutomationDirect has been awarded "Best Service in the Industry." In at least one product category, for four consecutive years by a leading industry trade publication. This has been possible by using such tools as a Helpdesk.

Installing a new phone system

As a direct company, we pride ourselves on service to our customers. A key component to this success lies in useful and effective communication tools. With the growth of the business, we were starting to see various performance issues with the existing phone system, where capabilities and expansion options were limited. The technology was fast becoming outdated and it was time to invest in a more modern system. We began our search for a new and more sophisticated phone system that would satisfy all of our requirements.

In June 2004, we installed an Inter-Tel Axxess system. We can now track each call as it enters our system and follow the path it takes until the call is completed. The phone system is a feature-rich system that will provide AutomationDirect a growth path of 600+ users. Some of the most popular features of the Axxess system include ScreenPops, enhanced voice mail and detailed reporting.

ScreenPops, provided by the Inter-Tel IVR, will allow us to provide faster customer service by displaying customer information to the call agent as the call is being answered.

The enhanced integrated voicemail system provides fast and clear voice messaging for system users. These new voicemail features include caller ID, record-call, undelete-deleted messages and timed date stamps.

The real-time call traffic status gives supervisory level information on any call as it is processed through the phone system. This same information is gathered as historical data, providing detailed reports of all calls routed into our business. This feature gives us the ability to monitor call traffic and to staff accordingly.

One of the requests from our customers was for same-day shipping on orders placed as late as 5:00 PM. Our internal users wanted more features for storing various levels of contact information. The list was long and challenging.

In October 2004, we implemented an entirely new system, Commerce Center from Prophet 21. This new system allows us to better track customer information and customer history with impressive speed; reporting capabilities are much improved and there are no more capacity issues. Going forward, the platform will support a link which includes incorporating the telephone system for ScreenPops (mentioned earlier). When an incoming call is received, the system will link the caller information into the customer database.

The agent’s display immediately provides details of the incoming call, saving time. In addition, improved integration with our shipping system has contributed to our ability to now ship orders placed as late as 5:00 pm (eastern time) the same day. It’s this cutting edge technology that allows us to continue to control costs and to provide our customers with the best prices possible.

In order to prepare for our new system, we began internal training with our sales, accounting, logistics and purchasing teams. Growth once again forced us to look at our existing system.

To ensure that a system will reliably fulfill our needs and support our growing company, a comprehensive inventory management/reduction, shipping/billing software module must be in effect.

With the existing system and somewhat "state" technology, the speed was not fast enough to satisfy a late-day shipping cut-off, and capacity problems were growing as speed continued to decline.

For a direct company focused on exceptional customer service this could be the most critical internal tool, so we began researching a solution to address as many requests as possible from both external customers and internal users.

To help make the transition to the new system smoother, we began training our employees internally by providing training classes with mock calls. During startup there were phone system company representatives on-site for the first two days. This assistance was extremely helpful, as internal users had many special requests. This would have been a difficult challenge for our communications team without the outside assistance.

To continue providing world class service and support to our customers with the best prices possible.

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In order to prepare for our new system, we began internal training with our sales, accounting, logistics and purchasing teams two months before implementation.

If you are beginning a system conversion as broad as this, you may want to consider over-allocation of personnel resources during the test, design and preparation phase. We had many projects occurring simultaneously during our phase of the design and could have benefited by spending more time training in some areas before going live.

Ultimately, the goal of system improvements should be more efficient service without distancing the customer from the supplier. Technology that is implemented simply to reduce person-to-person transactions may feel isolating and cause frustration. Customer service tools that both enhance human interactions and allow efficient electronic interactions are the best application of new technology to create an enjoyable customer experience.

"All great questions must be raised by great voices, and the greatest voice is the voice of the people—speaking out—prose, or painting, or poetry, or music, speaking out in homes and halls, streets and farms, courts and cafes. Let that voice speak and the stillness you hear will be the gratitude of mankind.”

— Robert F. Kennedy
A User's Guide to Configuring Serial Ports for DirectLOGIC PLCs: Part Two

by Robert Thornton, Product Engineer

AutomationDirect

Part Two of the Two-Part Series

in the previous issue of Automation Notebook, Winter 2005 Issue 3, we discussed the communications capabilities of Port 2 on the DL96, DL250-1, and DL260 DirectLOGIC CPUs. We covered networking, wiring diagrams and protocols. In this issue we will discuss how to configure the communication port using DirectSOFT programming software while connected to the CPU.

Menu setup

In the DirectSOFT software menu, select PLC (1). Then from the drop-down menu select Setup (2), then Setup Set. Comm Port (3), as shown in figure 1. The setup window (shown in figure 2) will appear.

Protocol setup

There are three protocols available standard, non-sequence and remote I/O. Each of these protocols will require some configuration.

Standard Protocols (figure 2)

You will notice in figure 2 that K-sequence, DirectNET and MODBUS protocols are all checked by default. These are the default protocols for the slave PLCs discussed in part one of this article. Select the desired protocol.

Time-out (3)

Time-out is the amount of time the port will wait for a response to a message it sent before it logs an error. It is only used when the PLC is the master device. Notice the selection is relative to the Base time-out listed next to each protocol, i.e. for K-Sequence, Base Time-out is 1 – 800ms.

RTS off delay (3)

RTS (Request to Send) is a hand-shaking signal to notify another device that the asserting device would like to transmit. RTS on and RTS off delay can typically be set to 3ms for 4-wire networks. For 2-wire networks, the values should be increased to 5ms and 2ms respectively. See figure 3.

Station Number (4)

The station number is the slave number or address. This is the number that will be polled by the master on the network. Typically this is set as 1 for the master. Slaves can be addressed from a through 90 for DirectNET protocol or 1 through 247 for MODBUS protocol, depending on the slave and CPU.

Baud rate (5)

Baud rate is the rate at which data is transmitted across the connection in bits per second (bps). A good starting point is 9,600 bps. If no problems are encountered, then increase the baud rate to the maximum achievable without communication problems.

Parity (6)

Parity is a low level form of error checking that counts the number of 1’s in the bit stream to ensure that none have been changed. The parity bit is turned on or off to achieve the correct number of 1’s in the data packet; either odd or even. If the number of 1’s is even when parity is set to odd, then the packet has been corrupted. This setting largely depends upon the required settings of the other equipment on the network.

The Baud rate, Stop bits and Parity must all be the same for every device on the network in order for communications to work properly.

Memory Address (7)

This is the beginning V-memory location to temporarily store the ASCII data coming in to the PLC. The memory address will consume nine consecutive V-memory addresses. The default is V0 (TAG). This must be changed or there will be a conflict between Timer T0 and the ASCII string.

XON/XOFF and RTS flow control (4)

Select XON/XOFF for software handshaking. It is essentially a software approach to RTS/CTS hardware handshaking. Select RTS if the port has the RTS signal wired between all devices. As with baud rate, stop bits and parity, every device on the network must be configured the same in order for communications to work properly.

Remote I/O Protocol (5)

Remote I/O Protocol (3) allows the CPU to use port 2 to either read or write (depending on CPU model) raw ASCII strings to devices such as barcode readers and printers.

Memory Address (4)

The Memory Address is the V-memory location to be used as the starting location of the Remote I/O configuration table. The default V37700 is recommended. Additional information can be found in the Remote I/O manual D2-REM10-W for configuring remote slave units on the network.

Saving the configuration to the CPU

Once all of the parameters are configured, they must be written to the CPU. This is done by selecting the icon located below the Close button. Select the icon that shows a blue arrow pointing to the PLC.

Troubleshooting

If problems are encountered, first check the settings common to all devices such as baud rate, parity, stop bits, etc. Make sure you are starting with a low baud rate such as 9,600, especially for long cable runs. Next, increase the timeout on the master device, such as a PLC or operator interface. Check the cable connections and cable integrity. Lastly, check the cable routing to ensure it is not routed in such a way as to pick up electrical noise from low/high voltage AC systems or variable frequency drives. For RS422 and RS485, verify that all required termination resistors are installed and sized correctly. If you construct your own cable, make sure that the RTS/CTS connections are jumpered together. Try increasing the RTS (on/off) delay times. Increase the delay time by 5 - 10ms. Also, check station number settings and make sure you are addressing the correct slave from your master.

For more information, refer to the following Technical and Application Notes posted on the technical support page of the AutomationDirect Web site:

AN-D2-002
CPUs Communications Port Parameters

AN-D2-003
DL96, D2-250-1, D2-260 to D2-240 R/S-232 Communications wiring diagram

AN-D2-004
DL96, D2-250-1, D2-260 to DL96, D2-250(-1), D2-260 RS-422/485 Communications wiring

AN-D2-005
RS-422/485 wiring connections to D.I./D.O. or RS-232 communications wiring

AN-D2-006
Using the D2-250, D2-250-1, D2-260, and DL96 to Communicate to a printer/data terminal

AN-EZ-003
EZTouch, EZTouch RS 422/485 wiring connections to D.I./D.O. or RS-232 communications wiring

AN-M15C-003
How to Connect DirectLOGIC PLCs through the M15C and E15 models
A Condensed Guide to Automation Control System Specification, Design and Installation

Control System Specification

In Part 1, W Inter 2005 Issue 3, we covered some safety aspects involved in the use of automated control systems and discussed some tips used in identifying which equipment and processes can be automated.

In Part 2, we will cover how to specify the various devices required for controlling the equipment in an automated system. Your specifications need to include not only the “controlling” devices for your application, but also items such as the housing or enclosure of the device, the type of wire required to meet the various codes, agency approvals required for safety and insurance purposes, environmental conditions, etc.

As stated in Part 1, special expertise is generally required to design, wire, install, and operate industrial automation control systems. Persons without such expertise or guidance should not attempt to design control systems, but should consider seeking the services of a qualified system integrator. Control systems can fail and cause serious injury to personnel or damage to equipment. The information in this series of articles is provided “as is” without a guarantee of any kind.

With that said, the first skill needed to develop in this effort will be the gathering of all the equipment parameters and specifications needed to specify the devices required to control the equipment. We need to be the proverbial detective who would ask questions such as:

- What is the operating voltage?
- What is the power rating?
- What is the on-state current?
- What is the off-state current?
- What is the relative humidity range?
- What are the mounting dimensions?
- What is the duty cycle?
- How will the system be used?
- Who will be using the control system?

Control System Design

The devices you need to specify in your control system will generally fall into one of three categories: input devices, output devices and the processing unit.

Input devices

Input devices are used to sense a condition, detect movement or position, indicate a limit or set point has been reached, sense intervention by an operator, detect an alarm, etc. Typical input devices may include limit switches, photoelectric sensors, push buttons, proximity sensors, an operator interface, etc. These input signals are generally in an ON or OFF state. We can look at an input from a device, such as a photoelectric sensor used to detect an obstruction, and state that when the sensor sees the obstruction, the sensor is ON; in other words we have a true condition. When the sensor is not obstructed, then the input is OFF; or we can say the condition is false. These types of signals are called discrete signals, meaning they are always one of two states: ON or OFF. They can be wired into a PLC input module and the PLC can be programmed to use the status of the signals to execute the logic to control the automated system. Or these same signals can be used in a “relay logic” system, where control relays are hardened to create the system logic.

Output devices

Output devices are used to control actions such as motion, start/stop of equipment like conveyors and pumps, on/off control of valves, operator alerts/prompts, status indications, etc. Typical output devices include relays, motor starters, pilot lights, operator interface graphics and numeric display, etc. These output signals, like input signals, are also discrete, either ON or OFF. The signals can be wired from a PLC output module to control the devices, such as starting and stopping motors, energizing a valve to control water flow, illuminating a pilot light to alert an operator to a condition such as “Bin Full”, etc. Output signals can also be wired directly to a controlling device using hardwired relay logic.

Technical Review

• Typical wiring for sinking and sourcing input devices
• Typical wiring for sinking and sourcing output devices

Cost restraints may require you to compare implementing the control system with either a PLC, PC-based control, or simple hardwired relay logic. But don’t forget the fact that a PLC

Certified control devices may have derating curves depending on the ambient temperature and the number of outputs energized. Keep in mind that DC output modules can be sinking or sourcing type.

The processing unit

All control systems can typically be defined as having inputs, outputs and some form of decision making going on in between so that the outputs are controlled based on the status of the inputs. This brings us to our third category, the “decision making” element. This element can be performed by a PLC, where we have inputs, outputs and a central processing unit (CPU) that uses ladder logic programming to make decisions based on input status and the logical conditions in the program (see figure 3). A similar device that can be looked at in the same manner is a personal computer (PC). The keyboard, mouse, scanner, etc. would serve as input devices and the monitor, printer, speakers, etc. would be the output devices. The microprocessor used on the motherboard, along with its memory, the operating system, and the application program would serve as the decision making element. As a matter of fact, PCs are used in some automated control systems as the decision making element, together with industrial input and output (I/O) modules. These PLC-based systems rely on the communication ports or Ethernet connections to monitor and control the I/O. The application software typically allows a programmer to develop graphical interfaces that give an operator interaction with the equipment or process. With some research and experience, you will learn how to determine how much “decision making” ability your control system requires. Cost restraints may require you to compare implementing the control system with either a PLC, PC-based control, or simple hardwired relay logic. But don’t forget the fact that a PLC
Introducing SureStep® Stepping Systems

Our SureStep® open-loop stepping system includes a high-performance microstepping drive, linear power supply, and high-torque motors that range from 83 oz-in to 434 oz-in of holding torque. The SureStep microstepping drive accepts industry-standard step and direction command signals from our DirectLOGIC family of PLCs or any other encoder or motion controller that provides sinking, sourcing, or differential outputs. All SureStep motors are built to industry-leading specifications and are connectorized for easy hook-up to the microstepping drive via an optional cut-to-length extension cable. The power supply is a dual output unit that can provide power for both motors and the digital interface.

One-size-fits-all microstepping drive

- Selectable step sizes of 400 steps per revolution (1-step) to 10 steps per revolution (10-step).
- One standard microstepping drive operates any or all four SureStep standard motors.
- Onboard screw terminals for easy hook-up.
- Optically isolated inputs ready for 5 VDC logic from DirectLOGIC PLCs.
- No software or add-on resistors required for drive configuration.

SureStep open-loop stepping system includes a high-performance microstepping drive, linear power supply, and high-torque motors that range from 83 oz-in to 434 oz-in of holding torque. The SureStep microstepping drive accepts industry-standard step and direction command signals from our DirectLOGIC family of PLCs or any other encoder or motion controller that provides sinking, sourcing, or differential outputs. All SureStep motors are built to industry-leading specifications and are connectorized for easy hook-up to the microstepping drive via an optional cut-to-length extension cable. The power supply is a dual output unit that can provide power for both motors and the digital interface.

One-size-fits-all microstepping drive

- Selectable step sizes of 400 steps per revolution (1-step) to 10 steps per revolution (10-step).
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An industrial induction motor may have ratings such as 230/460 VAC, 3-phase, 1725 RPM, a FLA (full load ampere) of 10.5 amps at 460 VAC, etc. This information can be obtained from the manufacturer’s catalog or directly from the motor nameplate. In the case of a motor, you will need the ratings to choose the motor starter or possibly a discrete signal that would cause an output point to start a pump to raise or lower the level.

Duty Cycle

When using a solenoid valve, you will want to know its operating voltage, nominal current draw and current inrush to help select the type of output device required to control its operation. It is also important to have an understanding of the solenoid valve’s duty cycle (time on vs. time off). We would not want to operate a solenoid valve rated at 50% duty cycle in a continuous mode with an on time of 10 seconds and an off time of only two seconds. The short off time would not allow for the solenoid to properly cool down.

Surge Suppression

Solenoid valves, motor starters, etc. make use of an inductive-coil for their operation and the coil can produce high voltage spikes that can damage output devices and nearby electronic equipment. It is always recommended to use some form of surge suppression to eliminate these voltage spikes.

Enclosure

Selecting the proper enclosure is important to ensure safe and proper operation of your equipment. The minimum considerations for enclosures should include:

- Conformance to electrical standards (Reference NEC).
- Protection from the elements in an industrial environment (Reference NEMA).
- Common ground reference (Reference NEC).
- Access to the equipment (Reference OSHA).
- Security or restricted access (Reference OSHA).
- Sufficient space for proper installation and maintenance of equipment.

Hunting/Coiling

Ensure that the devices used in your control system aren’t subject to overheating, or if installed in a colder climate, the devices aren’t being used below the listed low temperature operating range. Your control system, because of its physical location, may require you to have both a cooling system, such as an A/C unit, and a small heating unit as part of the same enclosure. This will ensure the devices are always operating within their temperature specifications. Basic thermal management is not difficult for most automated control systems. Investing a little thought during the specification stage can save you a great deal of redesign down the road.

A.C. Power

If using 120V AC voltage from a power supply in your control system, consider using a power supply rated for at least twice the calculated load. This should satisfy one of the requirements if you need to have your control system U.L.508 approved and will allow the power supply to operate at a lower temperature, thus increasing its life.
Environmental Specifications

The following table is an example of NEMA’s common environmental specifications that generally apply to automation equipment. IEC also has a list of common environmental specification designations for enclosures and equipment.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Category</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occasional prolonged submersion</td>
<td>2</td>
<td>1.5 MB max</td>
</tr>
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<td>2</td>
<td>1.5 MB max</td>
</tr>
<tr>
<td>Corrosive agents</td>
<td>2</td>
<td>1.5 MB max</td>
</tr>
<tr>
<td>Oil and coolant seepage</td>
<td>2</td>
<td>1.5 MB max</td>
</tr>
<tr>
<td>Hose down and splashing water</td>
<td>2</td>
<td>1.5 MB max</td>
</tr>
<tr>
<td>Dust, lint, fibers, and flyings</td>
<td>2</td>
<td>1.5 MB max</td>
</tr>
<tr>
<td>Falling liquids and light splashing</td>
<td>2</td>
<td>1.5 MB max</td>
</tr>
<tr>
<td>Falling dirt</td>
<td>2</td>
<td>1.5 MB max</td>
</tr>
<tr>
<td>Incidental contact with enclosure equipment</td>
<td>2</td>
<td>1.5 MB max</td>
</tr>
</tbody>
</table>

Static Electricity

Most equipment and devices will operate down to 5% relative humidity. However, static electricity problems occur much more frequently at humidity levels below 30%. Make sure you take adequate precautions when you touch the equipment. Consider using ground straps, anti-static floor coverings, etc. if you use the equipment in low-humidity environments.

Agency Approvals

Some applications require agency approvals for particular components. Some of these required approvals are:
- UL (Underwriters’ Laboratories, Inc.)
- CUL (Canadian Underwriters’ Laboratories, Inc.)
- CE (European Economic Union)

The requirements for any of these agency approvals need to be part of your specification and will determine the selection of most of your controlling devices.

Enclosure Lighting and Convenience Receptacle

It is always a good idea to include interior lighting for your control system enclosure or cabinet to help during routine maintenance to the control system. Provide a convenience receptacle inside the control system enclosure to supply power to test equipment, calibration equipment, etc.

Product Selection

Suppliers’ literature and Web sites are an excellent resource for evaluating product specifications. For industrial control product selection information for AutomationDirect products, refer to http://www.automationdirect.com/static/specs/productselection.html
FYI
Variable Frequency Drives

VFDs Frequently Asked Questions

By Keri Schieber, AutomationDirect

What is sensorless vector control?

A: Sensorless vector control is a techni-
que used in variable frequency drives to
rotate the force vector in the motor
without the use of a shaft position
sensor. The goal of AC sensorless
vector technology is to give the user “DC”
like control and VFD control: 1) When
the motor is directly coupled and run at
a low speed, it becomes very inefficient.
You could go with a high torque motor
that is significantly larger than the stan-
dard and would have the same results
most of the time. 2) Typical motors do
cannot cool themselves well at extremely
low speeds. The added heat buildup in the
motor manufacturer for additional
details. Note the international standard
is IEC 60034-17.

What is the difference between torque
control and torque limiting?

A: Torque control can be done with any
of AutomationDirect’s PID capable
drives. This would be a closed loop
system using torque as the process vari-
able. There should be both a torque
controller as well as a PID controller.
The user would establish a torque setpoint
and configure the drive to follow that
setpoint. If the torque limit was 10 HP, the
system would work better than a
volts/hertz drive. A vector drive allows
wider speed regulation and better
control in the lower speed range. Torque
limiting can be done with any
AutomationDirect’s, Hitachi’s SJ300
series drive. Instead of using an external
torque sensor, torque limiting uses the
drive’s internal current sensor. The
operator would set the torque limit, and
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The Break Room
Humorous stories and Brainteasers

Customer Service with a smile

An award should go to the United Airlines gate agent in Denver for being smart and funny, and making her point, when confronted with a passenger who probably deserved to fly as cargo.

During the final days at Denver’s old Stapleton airport, a crowded United flight was canceled. A single agent was rebuking a long line of inconvenienced travelers. Suddenly an angry passenger pushed his way to the desk. He slapped his ticket down on the counter and said, "I HAVE to be on this flight and it has to be FIRST CLASS."

The agent replied, "I’m sorry, sir. I’ll be happy to try to help you, but I’ve got to help these folks first, and I’m sure we’ll be able to work something out."

The passenger was unimpressed. He asked loudly, so that the passengers behind him could hear, "Do you have any idea who I am?"

Without hesitating, the gate agent smiled and grabbed her public address microphone. "May I have your attention, please?" she began, her voice bellowing throughout the terminal. "We have a passenger here at the gate WHO DOES NOT KNOW WHO HE IS. If anyone can help him find his identity, please come to the gate."

The man retreated as the people in the terminal applauded loudly. Although the flight was canceled and people were late, they were no longer angry at United.

Brainteasers

1. "Rebates on PLCs"
   A company that sells overpriced PLCs and needlessly expensive AC Drives decides to offer their customers a rebate. They offer $250 to each PLC customer, and $400 to each customer who bought an AC Drive. Unfortunately, the company has lost track of the number of customers who have purchased each product, but they do know that a total of 5,392 customers are eligible for one rebate or the other (no customers qualify for both rebates). After the rebate period ends the company realizes that only 1/3 of their PLC customers and only 1/8 of their AC Drive customers have applied for the rebates. Can you determine the total amount of all the rebates to be paid by the company?

2. "Husband and Wife"
   A husband and wife have a combined age of 91. The husband is now twice as old as his wife was when he was as old as she is now. What are their ages?

3. "The Queen Attacks"
   Place eight queens on a chessboard in such a way that none of the queens is attacking another queen. (Schuh)
   
   Congratulations all!

And thanks to all who visited us at National Manufacturing Week in Chicago. We’d like to congratulate the winners of the Automation I.Q. Challenge:

Laser Tool Kit Winners:
Sally Memmer
Kevin Brown
Doug Ward
Laurie Johnson

And the winner of the drawing for the Apple iPod was Chuck Knecht.

Congratulations all!

Please visit www.automationnotebook.com for brainteaser answers.
Please tell us what you think...

Log on to www.automationnotebook.com, or send an email to editor@automationnotebook.com to share comments, express an opinion or provide ideas for future issues. We invite readers to participate in application stories, technical questions and Break Room humor. If you have a submission for any of these sections, or an article idea, please email us. All submissions will be reviewed and considered.

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