GET MORE THAN YOU PAY FOR . . .

from AUTOMATIONDIRECT.com

Product Focus: Programmable Logic Controllers

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What can a PLC do for you?

Programmable Logic Controllers (PLCs) have been around for decades and are still the go-to control choice for automation projects worldwide. Used in a multitude of applications including assembly line control, food processing and packaging, luxury yacht automation, and even amusement park rides, PLCs are everywhere. The benefits provided by today's low-cost PLCs easily outweigh their expense, making them a must-have for modern-day production processes.

PLC Benefits

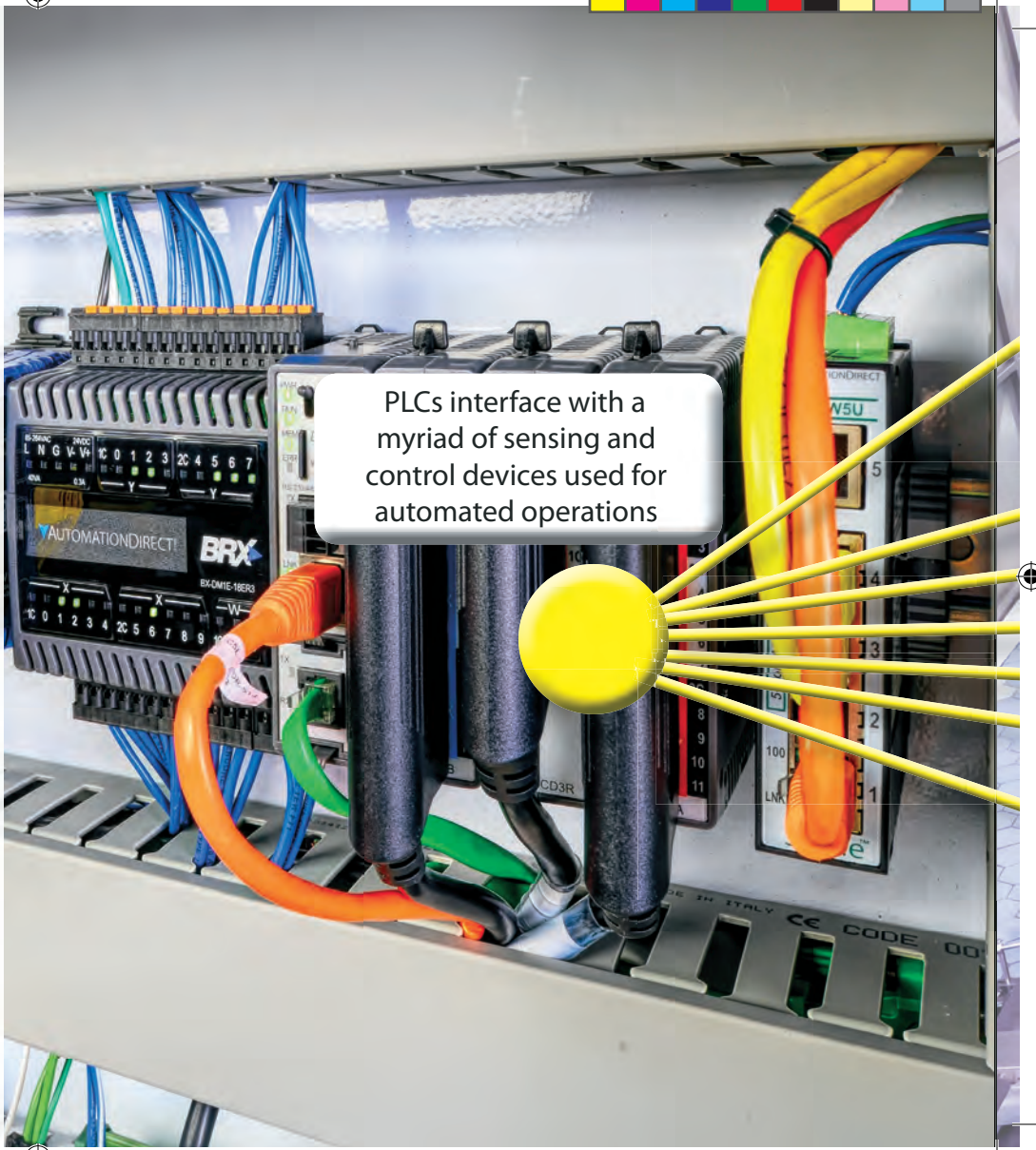
1. Cost-effective: PLCs are oftentimes much less expensive to install than the components needed to perform the same tasks, and they can be more efficient, which can lead to even more savings.

2. Utmost flexibility: PLCs have high processing speeds and can carry out complex functions including arithmetic, pulse tracking, condition monitoring, etc. They can also manage many inputs and outputs simultaneously, allowing one PLC to control and monitor many processes at once. Many changes needed to the process can be handled via the software, requiring no rewiring of components.

3. Longer life and reliability: PLCs are designed to handle the harsh industrial world and are constructed with solid state components, so there are no moving parts that can wear out over time and fail.

4. Easier troubleshooting: PLCs provide many diagnostic tools to help isolate malfunctions quickly, and replacing parts is much less time consuming than systems with hard wired control.

5. Less real estate required: PLCs have become more compact with many micro versions available today. The smaller form factors free up a lot of panel space compared to older control systems.



PROCESS SENSING

- Temperature
- Pressure
- Level
- Flow
- Vibration

MOTION CONTROL

- Stepper systems
- Servo systems
- Linear motion

DISCRETE SENSING

- Proximity
- Photoelectric
- Laser
- High speed
- Encoders
- Limit switches

OPERATOR INTERFACE

- HMI
- SCADA
- Marquees/ message displays

PILOT DEVICES/ INDICATORS

- Pushbuttons/ E-stops
- Indicators/ stacklights
- Selector switches
- Audio signal devices

PNEUMATICS

- Cylinders
- Valves
- Rotary actuators
- Grippers

MOTORS/DRIVES

- AC motors
- DC motors
- Drives
- Soft starters

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9 Helpful Steps for Specifying PLCs

When choosing the most effective controller for your application, the following steps can serve as a checklist of things to consider when determining programmable logic controller requirements. Listed are the most important areas to consider when choosing a control system and can help determine your system needs.

Step 1. Proposed System

Determine whether your system is new or existing. Will your system be installed from scratch or are there existing products already installed? The rest of your system will need to be compatible with new components. Or you may need to consider replacing an aging system altogether.

Why this is important:

Certain controller products may not be compatible with others. Making sure your existing products are compatible with any new products you are researching will save you time and money.

Step 2. Environmental Issues

Consider any environmental issues that will affect your application (temperature, dust, vibration, codes specific to your facility, etc.)

Why this is important:

Certain environments may affect the operation of a controller. For example, typical controllers have an operating temperature of 0-55 degrees Celsius (32-130 degrees F). If your application will include any extreme environmental conditions, or you have specific codes at your facility that must be met, you will need to either research products that meet those specifications or design the installation to meet requirements.

Step 3. Discrete Devices

Determine how many discrete devices your system will have and which types (AC, DC, etc.) are needed.

Why this is important:

The number and type of devices your system will include is directly linked to the amount of I/O that will be necessary for your system. You will need to choose a controller that supports your I/O count requirements and has modules that support your signal types.

Step 4. Analog Devices

Determine how many analog devices your system will have and which types (voltage, current, temperature, etc.) are needed.

Why this is important:

Same as with discrete devices, the number and type of devices your system will include is directly linked to the amount of I/O that will be necessary for your system. You will need to choose a controller that supports your I/O count requirements and has modules that support your signal types.

Step 5. Specialty Modules or Features

Determine whether your system will require any specialty features. Will your application require high-speed counting or positioning? What about data logging, a real-time clock, or other specialty feature?

Why this is important:

Specialty functions are not necessarily available in all controller CPUs or in standard I/O modules. Understanding the special functions your system may perform will help you determine which CPU to choose and whether or not you will need to purchase additional specialty modules.

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Step 6. CPU Requirements

Determine the type of CPU you will need. How much memory will your system require? How many devices will your system have (determines data memory)? How large is your program estimated to be, and what types of instructions will your program include (determines program memory)? How fast a scan time do you need?

Why this is important:

Data memory refers to the amount of memory needed for dynamic data manipulation and storage in the system. For example, counter and timer instructions typically use data memory to store setpoints, current values, and other internal flags. If the application requires historical data retention, such as measured device values over a long period of time, the size of the data tables required may determine the CPU model you choose.

Program memory is the amount of memory needed to store the sequence of program instructions that have been selected to perform the application. Each type of instruction requires a specific amount of program memory. Applications that are basically sequential in nature can rely on the I/O device rule of thumb to estimate program memory (5 words of program memory for each discrete device and 25 words for each analog device); complex applications will be more difficult to judge.

If scan time is important in your application, consider the CPU processor speed as well as instruction execution speed. Some CPUs are faster at Boolean logic but slower with data handling instructions. If special functions such as PID are required, the CPU you select may make those functions easier to perform.

Step 7. I/O Locations

Determine where your I/O will be located. Will your system require only local I/O, or both local and remote I/O locations?

Why this is important:

If subsystems will be needed at long distances from the CPU, you will need a controller that supports remote I/O. You will also have to determine if the remote distances and speeds supported will be adequate for your application. Ethernet-connected I/O hardware is becoming one of the more popular communication standards. This I/O may also be referred to as distributed I/O, and may require a particular protocol, such as Modbus.

Step 8. Communications

Determine your communication requirements. Will your system be communicating to other networks, systems or field devices?

Why this is important:

Communication ports (other than the programming port) are not always included with a controller.

Knowing your system communication requirements will help you choose a CPU that supports your communication requirements, or additional communication modules if necessary.

Step 9. Programming

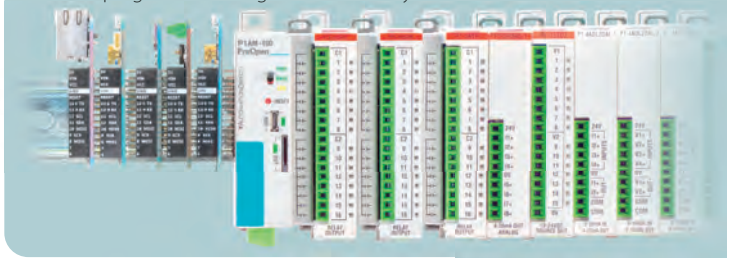
Determine your programming requirements: Does your application require only traditional programming instructions, or are special instructions necessary? Do you prefer fixed memory addressing or tag name based control? Which programming language are you accustomed to?

Why this is important:

Certain controllers may not support every type of instruction. You will need to choose a model that supports all instructions that you may need for a specific application. For example, built-in PID functions are much easier to use than writing your own code to perform closed-loop process control. Typical instructions such as timers, counters, etc., are available in most controllers. Also, many variations exist when it comes to the programming language (ladder logic, structured text, etc.) and memory addressing (fixed or tag name based). Choose the programming package that you are most comfortable with and that will offer the most ease of use when developing, troubleshooting, and maintaining.

Something to Consider: Open-source Control

With the growing popularity of low-cost single-board controllers and the "Maker" communities that support them, it was only natural for them to find their way into the industrial realm. Off-the-shelf single-board controllers are intended for hobbyists and students but the automation industry needs an open-source controller that can handle extreme conditions. The ProductivityOpen controller family offers industrial open-source controllers designed for harsh environments that are programmed using C++ or CircuitPython.



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Choosing the Right PLC for the Job

Once you have your control system specifications, it's time to decide which PLC is right for the job. PLC suppliers are abundant in today's industrial automation market. With so many choices, it can often get confusing as to which PLC will work best for your particular application. At AutomationDirect, we try to serve the controller needs of as many industrial automation professionals as possible. Therefore, we offer many PLC choices, each intended to fulfill a particular need or purpose.

FREE software and FREE Tech support!

SIMPLE CONTROL

HUGE VALUE FOR SMALL SYSTEMS

STARTING AT $92.00

The CLICK PLC family is ideal for everyday applications. The compact size and simplified programming make CLICK great for small systems and beginner projects.

#1 Value in Automation!

Productivity® Series

ADVANCED ALL-PURPOSE CONTROL

EXTREME VERSATILITY FOR
THE WIDEST RANGE OF APPLICATIONS

CPUS STARTING AT $237.00

The Productivity PLC family offers the utmost versatility in both hardware and software. This scalable PLC line will easily conform to systems large or small and features tag name programming, utmost device integration, and WOW factors such as onboard analog module data displays.

Do-more!

HIGH-PERFORMANCE CONTROL

EQUIPPED TO TACKLE THE MOST
DEMANDING PROJECTS

STARTING AT $205.00

The Do-more PLC family has one of the most advanced instruction sets in the market and many other tools/features to help you tackle complex applications.

LS ELECTRIC XGB PLC

MADE FOR MOTION

ADVANCED MOTION-CENTRIC CONTROLLER

STARTING AT $299.00

The LS PLC family offers highly advanced controllers geared for motion applications, while also offering high-level features, such as EtherCAT support and IEC standard programming languages, that can be beneficial in any automated system.

EtherCAT®

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SIMPLE CONTROL

The CLICK micro-brick PLC (starting at just $92.00, with FREE easy-to-use programming software) is by far the most practical PLC for the smallest of applications and the perfect tool for beginners.

CLICK PLCs are perfect for…

- Beginner projects
- Easy relay replacement
- Small applications including:
  - Conveyor VFD speed control
  - Tank level control with pump switching
  - Sorting line diverter control
  - Simple pneumatic control
  - Lighting control
  - Home automation projects
- Analog signal splitter applications
- Process monitoring/remote visibility (remote I/O)
- Streamlined PID control
- Modbus RTU to TCP conversion

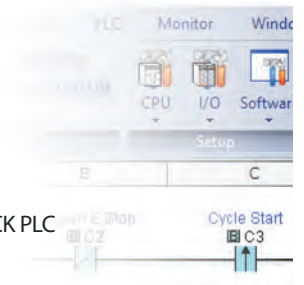
CLICK PLC units with embedded I/O starting at $92

CLICK PLUS PLC features:

- All the great features of the original CLICK PLC
- Wired and wireless CPU options
- Data logging (microSD support)
- IIoT ready with MQTT protocol
- Modbus RTU, Modbus TCP and EtherNet/IP protocol support
- Wi-Fi with Bluetooth provisioning
- Micro USB programming port
- Option module slot(s) for custom I/O configurations in lieu of fixed I/O
- Simple 3-axis PTO/PWM motion control
- Enhanced security
- Secure email using TLS

CLICK PLUS CPUs with up to two option slots for customized I/O configurations starting at $97

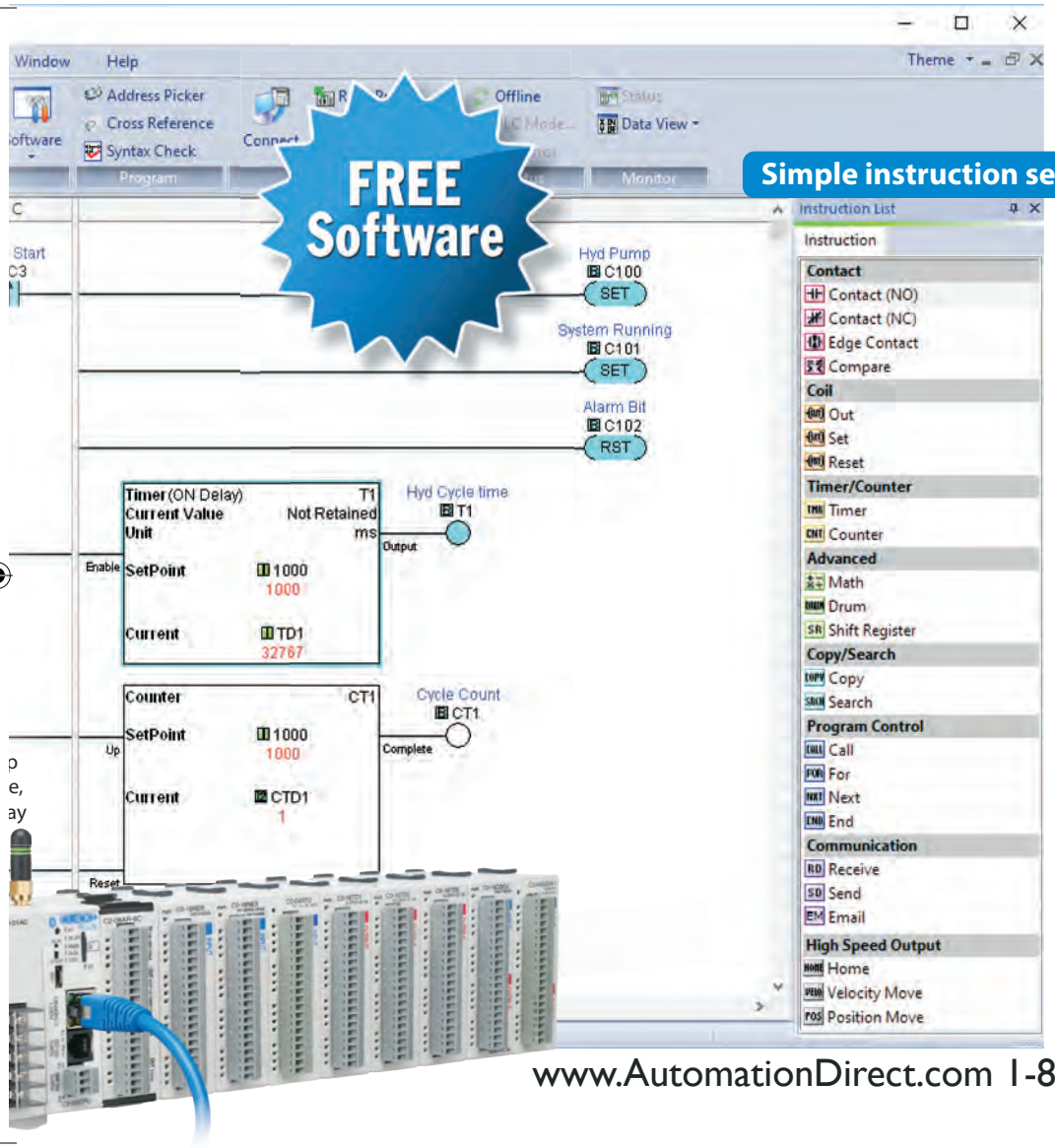
www.clickplcs.com



Expandable with up to 8 analog, discrete, temperature, or relay I/O modules

CLICK PLCs STRONG POINTS:

- Extreme value
- Small size
- Simplicity with low learning curve
- Straightforward programming with a simple but practical instruction set
- Easily paired with C-more micro HMI



APPLICATION STORY

Automating a Big Rig Light Show

Check out how a truck customization shop expanded their capabilities by using AutomationDirect CLICK PLCs to control elaborate on-vehicle lighting displays.

https://go2adc.com/truck

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ADVANCED CONTROL
(tag name memory addressing)

The Productivity family of PLCs is our most versatile family. Each series offers different I/O capacities but all use the same programming software, allowing you to easily scale your control hardware up or down depending on the application. The ProductivitySuite software provides versatile programming with tag name addressing that has no predefined memory structure.

Great for any application including:

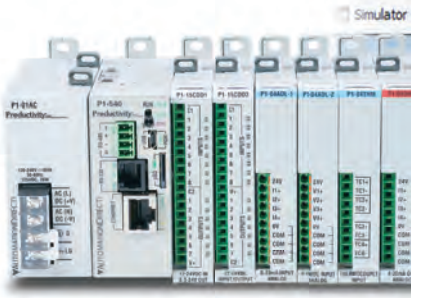
- Waste water treatment
- Stepper/servo control systems
- Precision package tracking and sorting
- Bottling applications
- Electrical switchgear applications
- HVAC /chiller tower control
- Car wash systems
- Industrial oven control
- Communication-heavy or diverse applications

www.productivityplc.com

Productivity PLCs STRONG POINTS:

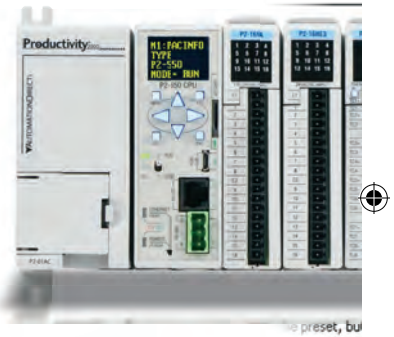
- Tag name memory
- Large I/O count
- Built-in communication options
- ABS certified modules
- Web server/mobile access
- Database sharing (great for SCADA/HMIs)
- Two-dimensional data arrays (sorting/tracking)
- Data displays
- Scalable hardware options

Productivity®1000 ..... *CPUs starting at $237*



- Up to 5 built-in comm ports: micro USB, serial RS-485, serial RS-232, Ethernet 10/100Mbps, and remote I/O ports
- Data logging up to 32GB on a microSD card (sold separately)
- Slim, stackable, super compact design
- Add up to 8 I/O modules for a total of 128 discrete I/O points or 32 analog I/O channels
- Choose from spring clamp, screw terminal or the popular ZipLink wiring solution for your I/O wiring needs

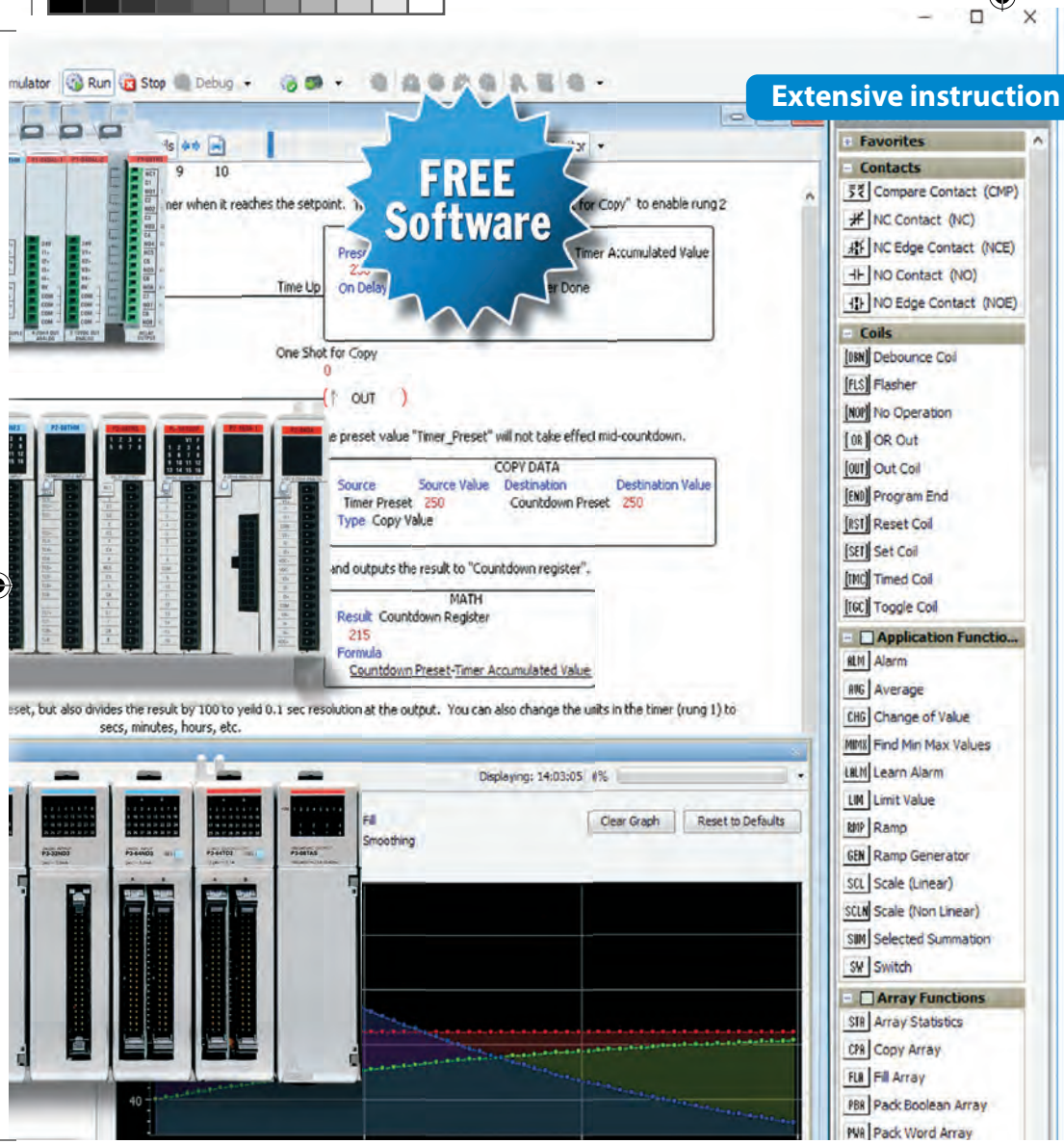
Productivity®2000 ..... *CPUs starting at $299*



- 5 built-in comm ports: plug-and-play USB programming port, general purpose Ethernet 10/100Mbps port, remote I/O Ethernet 10/100Mbps port, and 2 serial ports
- Data logging up to 32GB on a microSD card (sold separately)
- Programmable 4-line OLED message display on CPU for system status and tag data readouts
- OLED displays on select analog modules for real-time, no meter required measurements
- Up to 480 local I/O points and 4,320 total I/O through remote expansion

Productivity®3000 ..... *CPU priced at $750*

- 6 built-in comm ports: USB programming port, USB expansion port, serial RS-485, serial RS-232, general purpose Ethernet 10/100Mbps port, remote I/O Ethernet 10/100Mbps
- Programmable 4-line LCD message display on CPU for system status and tag data readouts
- LCD displays on all analog modules
- Support for local expansion and remote I/O bases, up to 59,840 I/O points



APPLICATION STORY

Mining Sunbeams – Solar Thermal Leverages the Sun for Producing Heat Energy

See how Productivity PLCs are used in a control system designed to maximize heat production and efficiently manage the distribution of heat to a variety of processes.

https://go2adc.com/solar

ADVANCED CONTROL
(fixed memory addressing)

The Do-more! PLC control technology was developed to efficiently tackle complex applications. This PLC series, with its numerous hardware and software features, provides an extensive toolbox to help you master the most demanding projects.

Do more with advanced applications including:

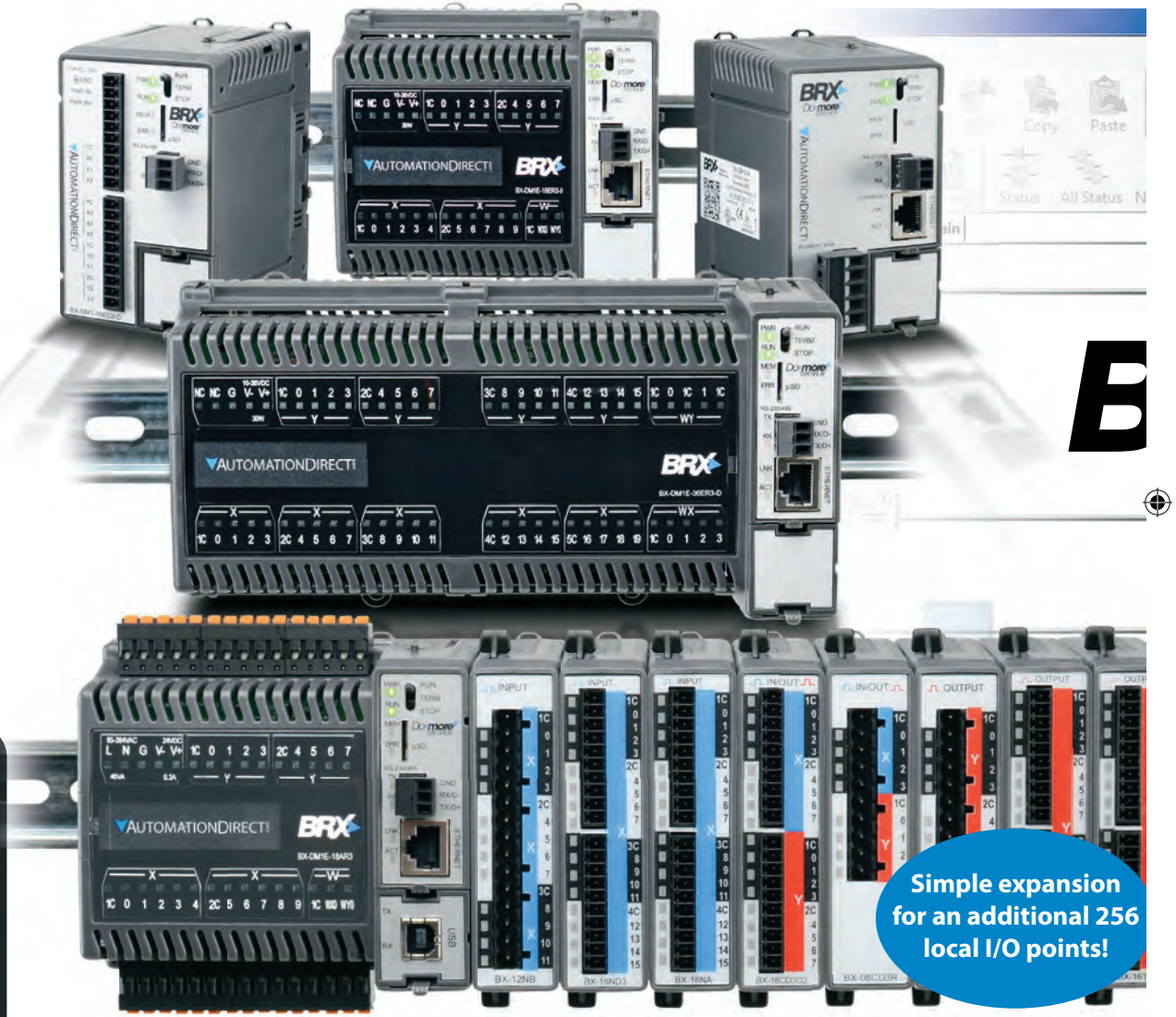
- Waste water treatment
- Stepper/servo control systems
- Simple to mid-range motion control
- Electrical switchgear applications
- HVAC /chiller tower control
- Precision valve control
- Object positioning
- Building automation
- Bar code systems
- Bar code systems
- IIoT/Big Data applications

www.do-more.com

BRX PLCs start at $205
(models with and without embedded I/O available)

Do-more BRX PLCs STRONG POINTS:

- Motion control
- Built-in high speed I/O
- PWM outputs
- Email with attachments
- Robust Instruction set
- Data file management
- MQTT(S)/HTTP(S)/FTP protocols
- Rest API
- Embedded webserver
- Embedded video help



Do more! DRIVEN

FREE advanced programming software with powerful development tools and over 200 instructions

APPLICATION STORY

Installing a Rock-Solid Automation Retrofit

This electrical contractor relied on AutomationDirect's BRX PLC hardware and software to rapidly rip-and-replace the controls on a failing rock crusher.

https://go2adc.com/rip-replace

ADVANCED CONTROL
(IEC-based programming)

By combining products from a well-established global PLC manufacturer (LS Electric) with a customer-focused value-centric online supplier, you get the best of both worlds, also known as the LS Electric XGB PLC from AutomationDirect. This controller has many great features including cutting-edge motion control and FREE advanced IEC-based programming software. Add to that the customer satisfaction, the amazing $299.00 starting price, and the FREE tech support provided by AutomationDirect, and you'll definitely say "YES!" to LS!

Great for many applications including:

- Palletizers
- Pick-and-place applications
- Rotary tables
- Flying cutoff systems
- Precision machining tools
- Automated welding systems

LS XGB PLCs with embedded I/O start at $299

LS ELECTRIC XGB

PLC

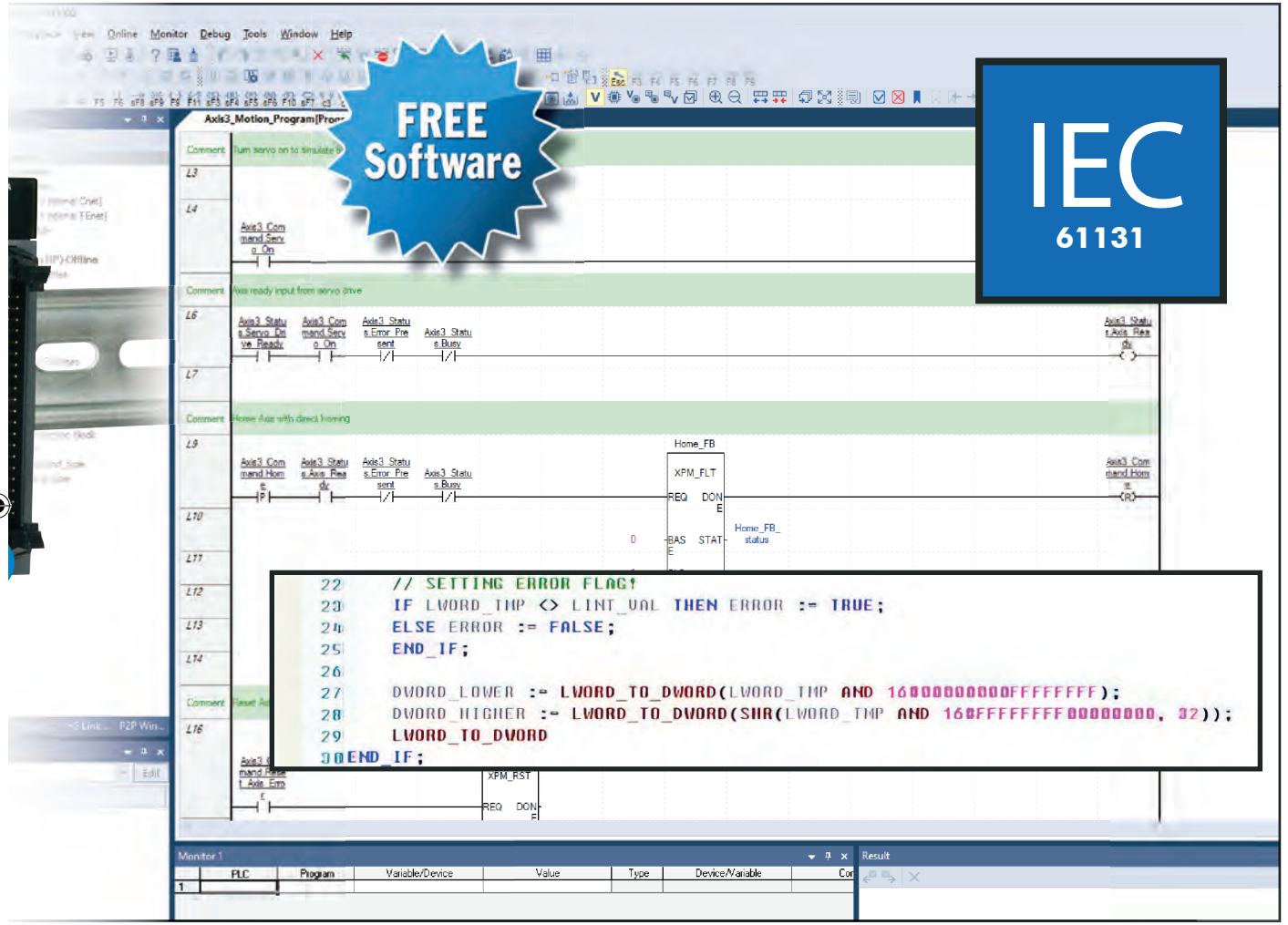
www.automationdirect.com/xgb-plc

EtherCAT®

The LS Electric XGB series controller is a motion control powerhouse. This PLC provides numerous motion control capabilities using the integrated 2- or 6-axis pulse/direction motion inputs/outputs (up to 200kHz) on the CPU module, plus up to 4 channels of high-speed inputs at up to 500kHz on each high-speed counter module, and up to 16 axes of motion control utilizing EtherCAT modules.

LS XGB PLC STRONG POINTS:

- Advanced motion control with up to 400 moves per axis and various single- and multi-axis operations
- FREE IEC programming environment with structured text, ladder logic, and more
- Multiple networking options including support for EtherNet/IP, Modbus TCP, Modbus RTU and ASCII
- High-density I/O
- High-speed I/O (integrated 2- or 6-axis pulse/direction motion inputs/outputs



The LS Electric XGB PLC can be programmed using four of the five languages included in the IEC 61131 standard for industrial controllers:

1. Ladder Diagram (LD)
2. Structured Text (ST)
3. Sequential Function Chart (SFC)
4. Instruction List (IL)

You can decide whether to utilize well-established Ladder Logic or go with the text-based Structured Text language. Maybe you prefer graphical Sequential Function Charts to organize your program. With the LS XGB PLC you can pick the language you or your customers prefer and run with it. With Ladder or Structured Text, the XG5000 software has many versatile function blocks available, including advanced motion control specific blocks, convenient when programming complex systems.

And don't forget, this advanced software is 100% free and can be downloaded anytime from our webstore.

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ADVANCED CONTROL
(CODESYS IEC-based programming)

The P2CDS-622 CPU features a CODESYS runtime application housed in a Productivity2000 controller form factor. This CPU has ample communication capabilities, works seamlessly with low-cost Productivity2000 I/O modules, and includes the CODESYS IEC 61131-3 -compliant software package along with several add-on licenses free of charge, so you can now reap the benefits of this powerful platform without breaking the bank.

CODESYS is the most widely used manufacturer independent IEC 61131-3 development system on the market. With over 5 million device licenses sold worldwide, more than 500 control system manufacturers, and tens of thousands of companies using CODESYS products, this programming package has reliably served a wide variety of industries and applications.

ProductivityCODESYS CPU priced at $529

ProductivityCODESYS STRONG POINTS:

- Low-cost, reliable Productivity2000 hardware
- CODESYS Development Environment - Full IEC 61131-3 compliant
- Data displays
- Dual Ethernet ports, for communication over two separate networks, ideal for IT/OT communication
- Multiple add-on licenses included

CODESYS + Productivity2000

If you know and love CODESYS but have stayed away from implementing it in mar of your applications because of high hardware costs, then the Productivity family of controllers has what you need. We've taken the time-tested Productivity2000 hardware and combined it with a CODESYS processor so you can afford to deploy CODESYS in many more ways, bringing a powerful world-renowned IEC-based programming package to applications large and small.

www.automationdirect.com/productivity-codesys

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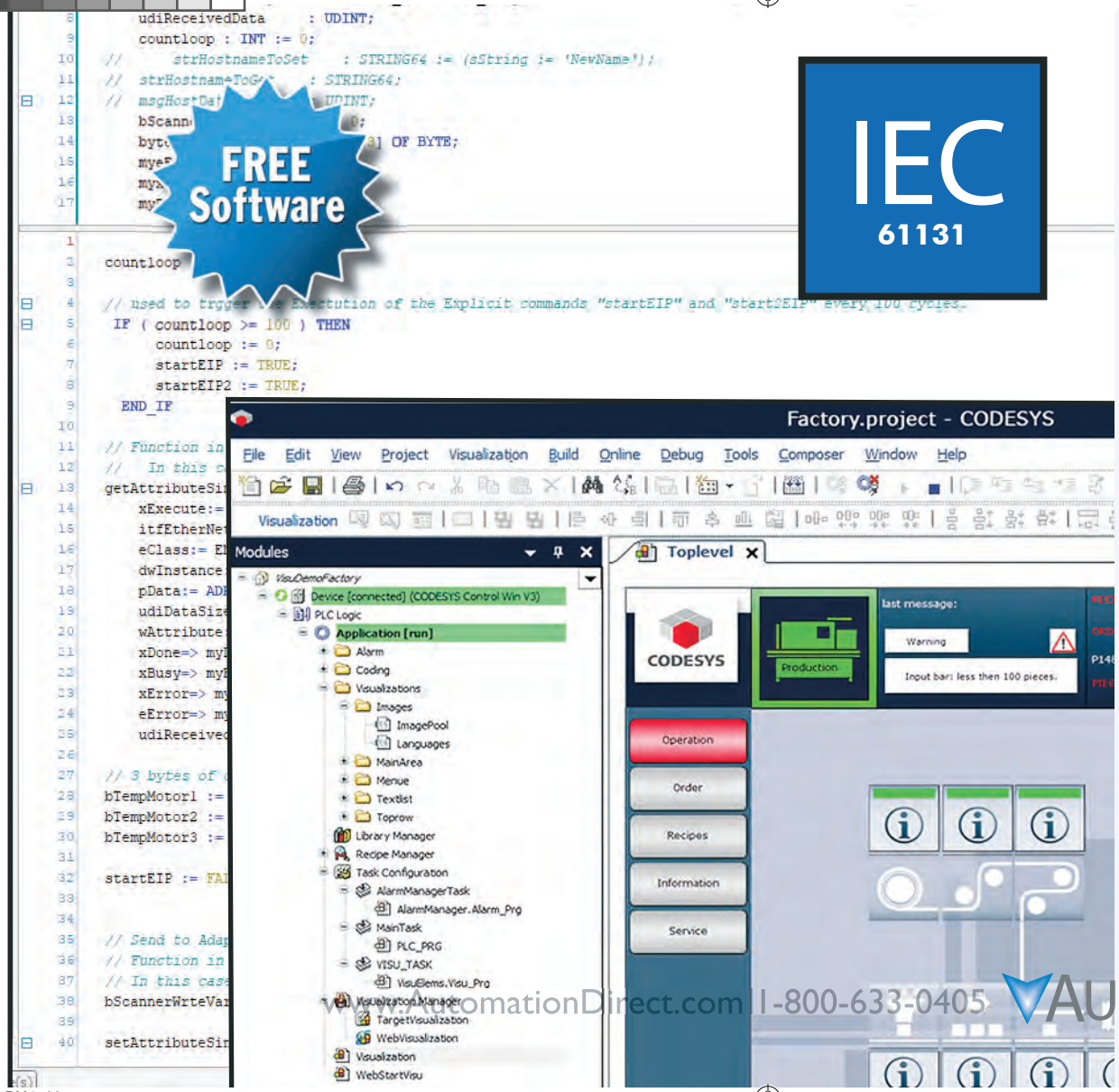

CODESYS Development Environment

- Full IEC 61131-3 compliant
  - Sequential Function Chart
  - Ladder Diagram
  - Function Block
  - Structured Text
  - Plus Continuous Function Chart (CFC)
- Fieldbuses included (normally purchased separately):
  - Modbus RTU
  - Modbus TCP
  - EtherNet/IP Scanner
  - EtherNet/IP Adapter
- Visualization - WebVisu included (normally purchased separately)
- IIoT library included (normally purchased separately):
  - MQTT Client w/ TLS
  - Web Client (http, https)
  - AWS IoT Core Client
  - Azure IoT Hub Client
  - Mail Service (POP3, SMTP)
  - SNTP Service
  - SNMP Library
  - SMS Service
  - JSON

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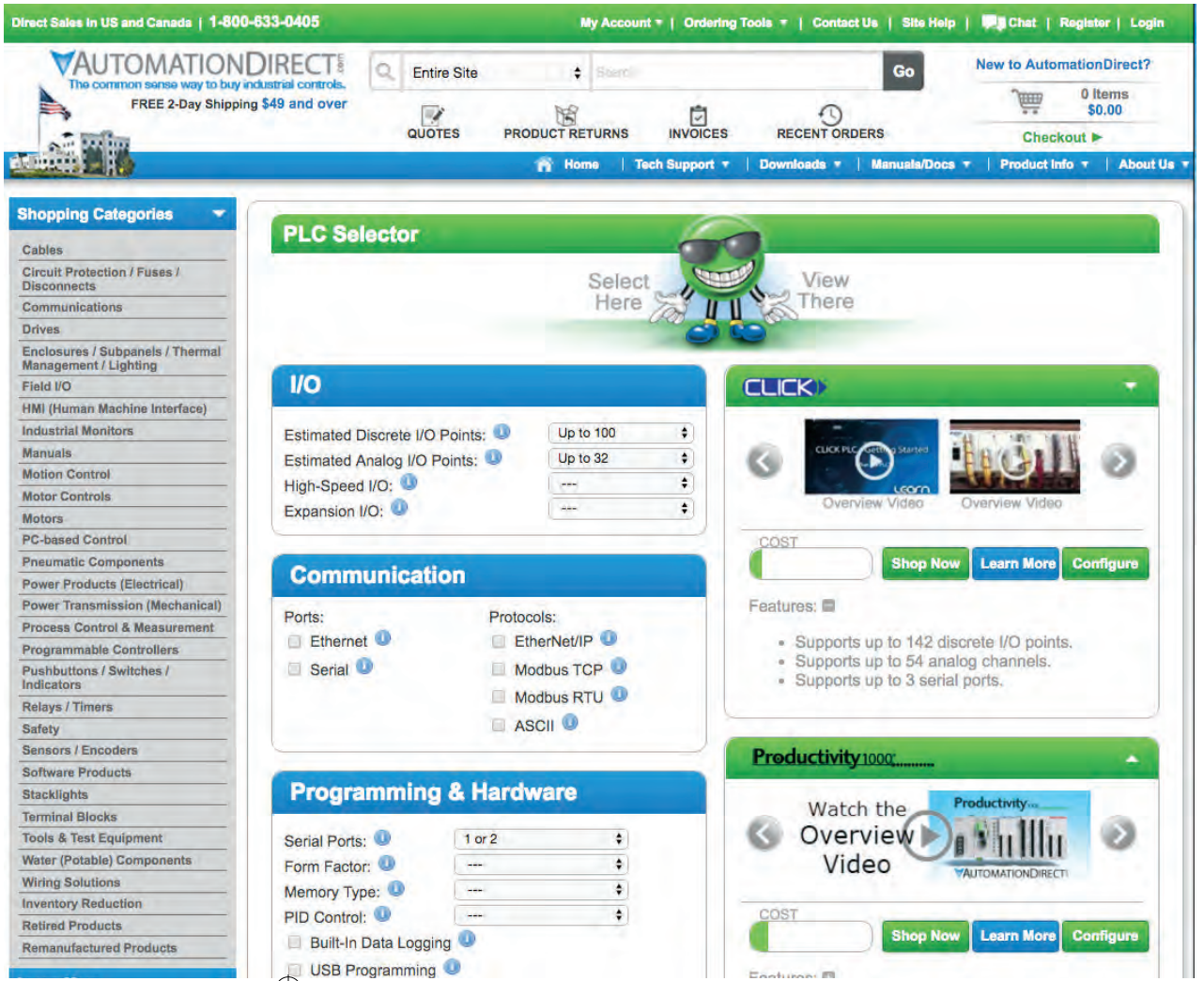
Still unsure which PLC is for you? Let us help.

When it comes to deciding which one of our PLCs is the one for your application, we want to help. Our online interactive PLC selector tool can help get you on the right path to the right PLC. Simply choose the type and amount of I/O, the type of communication, and any hardware or software requirements. The tool will then display the suitable PLC families for your selections, along with overview videos, cost comparisons, and feature listings.

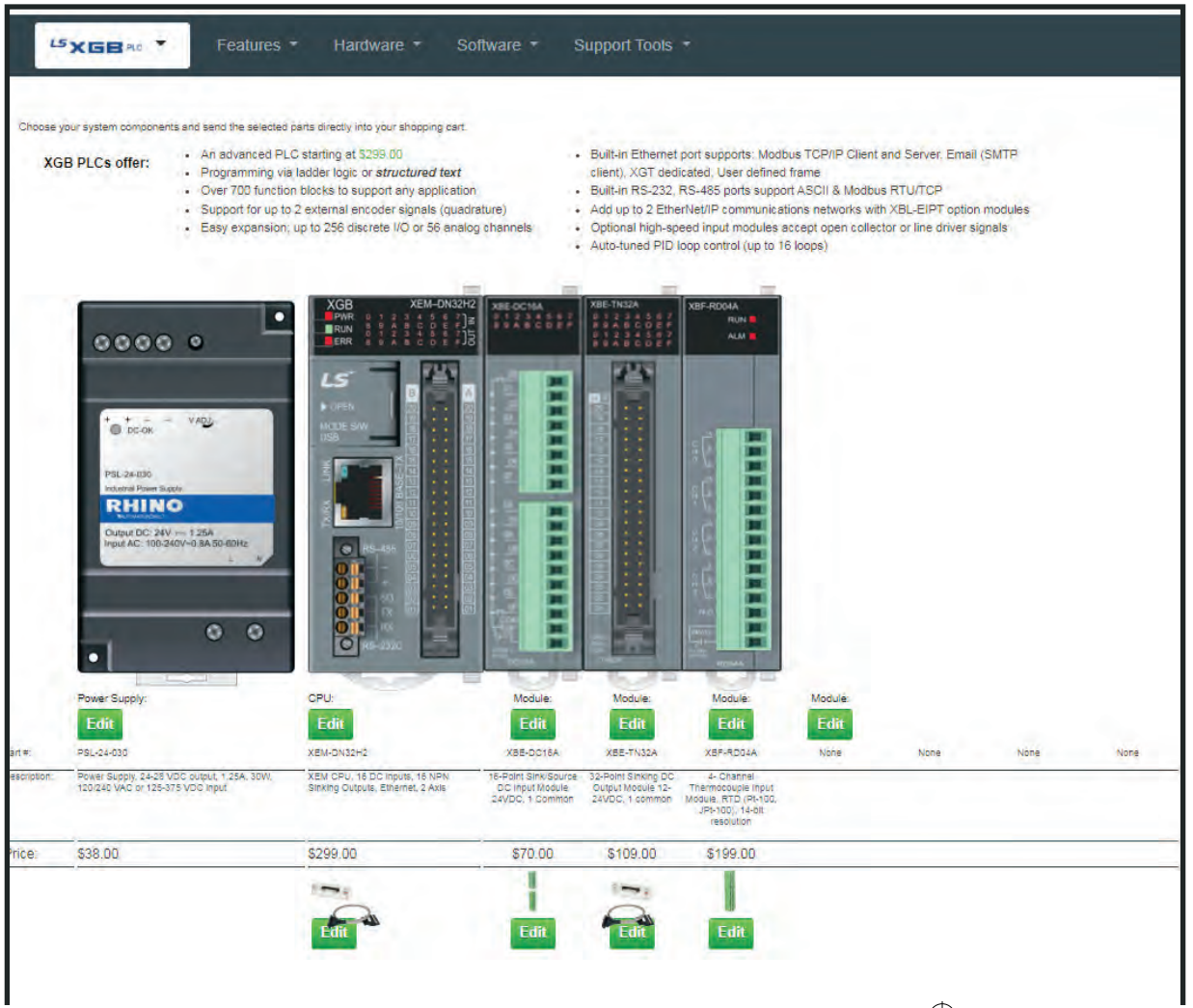
FREE online PLC selector: http://go2adc.com/select-plc

And don't forget, our tech support group is available at 1(800) 633-0405 to answer any questions you may have about the capabilities of our many PLC products.

PLC Family Selector



LS XGB PLC Configurator



Once you decide which PLC family you need, use our convenient PLC configuration tools to build a custom control system for your application. We have configurators for ALL our PLC series! Simply add your components including power supplies, CPU, I/O modules, preferred connections, accessories, etc. Once you have it all configured, click "Add to Cart" and all of your components will be added directly to your shopping cart for easy checkout!

FREE software and FREE technical support for all our PLCS!

AUTOMATIONDIRECT.com

INDUSTRIAL OPEN-SOURCE CONTROL

With the growing popularity of single-board controllers and the risks involved with implementing them in industrial applications, it was apparent that our industry needed an open-source controller that would hold up in the most extreme conditions.

Produced in conjunction with FACTS Engineering, the ProductivityOpen controllers are just that, as they combines the best of both worlds - Maker ingenuity coupled with our Productivity controller family's proven reliability.

The ProductivityOpen CPUs are blank canvases and with the right know-how, you can make them do almost anything:

- Simple data logging
- IIoT functions
- Pick and place
- Greenhouse automation
- HVAC control
- Water treatment processes
- Package/material handling
- Generator switchgear
- Lighting control
- The possibilities are ENDLESS!

Industrial-Grade CPU (Arduino-Compatible)

$69

Productivity® Open

With the ProductivityOpen platform you get all the great features of a standard Arduino plus the added power and reliability of an industrial controller.

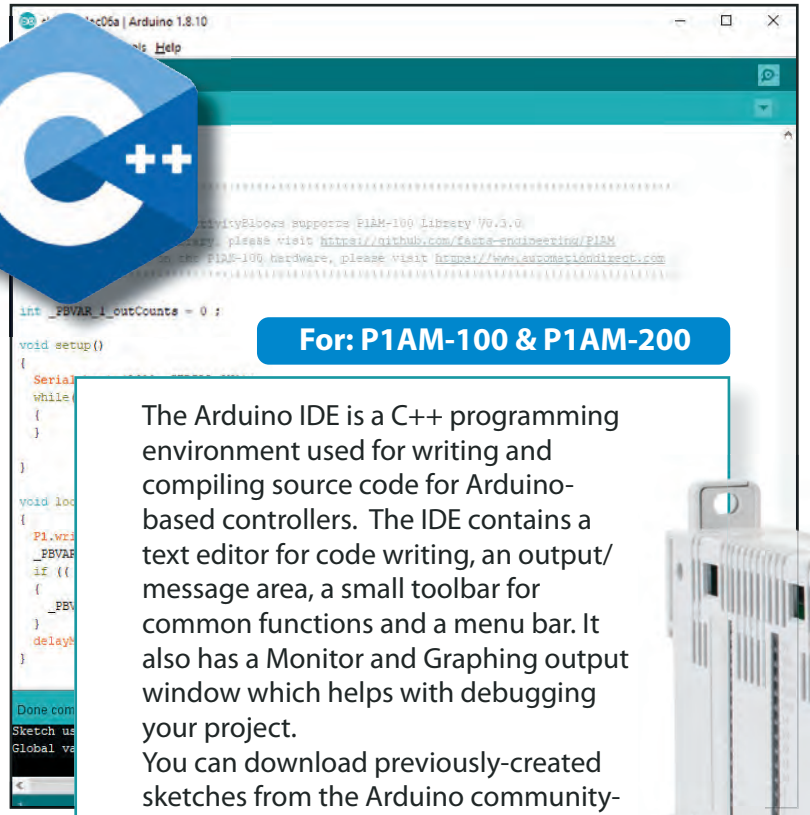
- Open-source sample code available
- C++ (Arduino IDE) / CircuitPython programming
- Add-on shields for product optimization
- Low cost controller

+

- Industrialized power supply for EMI and ESD protection
- UL61010 listed for industrial applications
- Expandable I/O with over 240 points using right-side I/O modules and left-side shields
- Compatible with Productivity1000 I/O modules (also UL61010)
- Industrial-grade shields for Ethernet, RS232 & RS485 serial, GPIO, and prototyping
- ProductivityBlocks, intuitive block programming software (Arduino legacy IDE v. 1.8.19 or earlier)

www.automationdirect.com/P1AM

The Productivity®Open UL/CE-certified open-source CPUs mimic the Arduino® MKRZero microcontroller, seamlessly supporting both standard 3rd-party MKR shields and industrial PLC I/O.

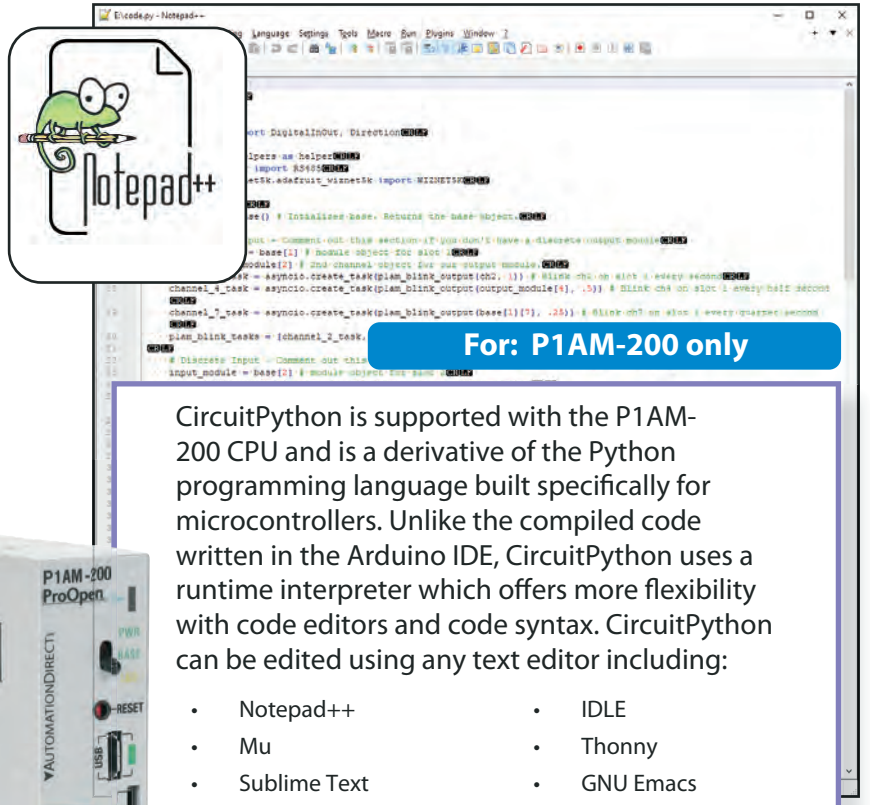


For: P1AM-100 & P1AM-200

The Arduino IDE is a C++ programming environment used for writing and compiling source code for Arduino-based controllers. The IDE contains a text editor for code writing, an output/message area, a small toolbar for common functions and a menu bar. It also has a Monitor and Graphing output window which helps with debugging your project.

You can download previously-created sketches from the Arduino community-at-large for "code-in-an-instant" or create your own using C++ or the super-easy ProductivityBlocks interface.

ProductivityBlocks is supported by the P1AM-100 CPU and the Arduino legacy IDE (version 1.8.19 or earlier).



For: P1AM-200 only

CircuitPython is supported with the P1AM-200 CPU and is a derivative of the Python programming language built specifically for microcontrollers. Unlike the compiled code written in the Arduino IDE, CircuitPython uses a runtime interpreter which offers more flexibility with code editors and code syntax. CircuitPython can be edited using any text editor including:

- Notepad++
- Mu
- Sublime Text
- IDLE
- Thonny
- GNU Emacs

As with Arduino IDE programming, CircuitPython has a large open-source development community providing users with a wide assortment of libraries and example code for various applications.

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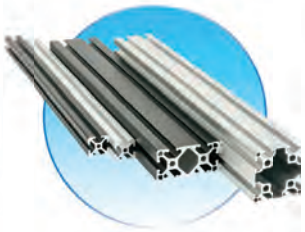

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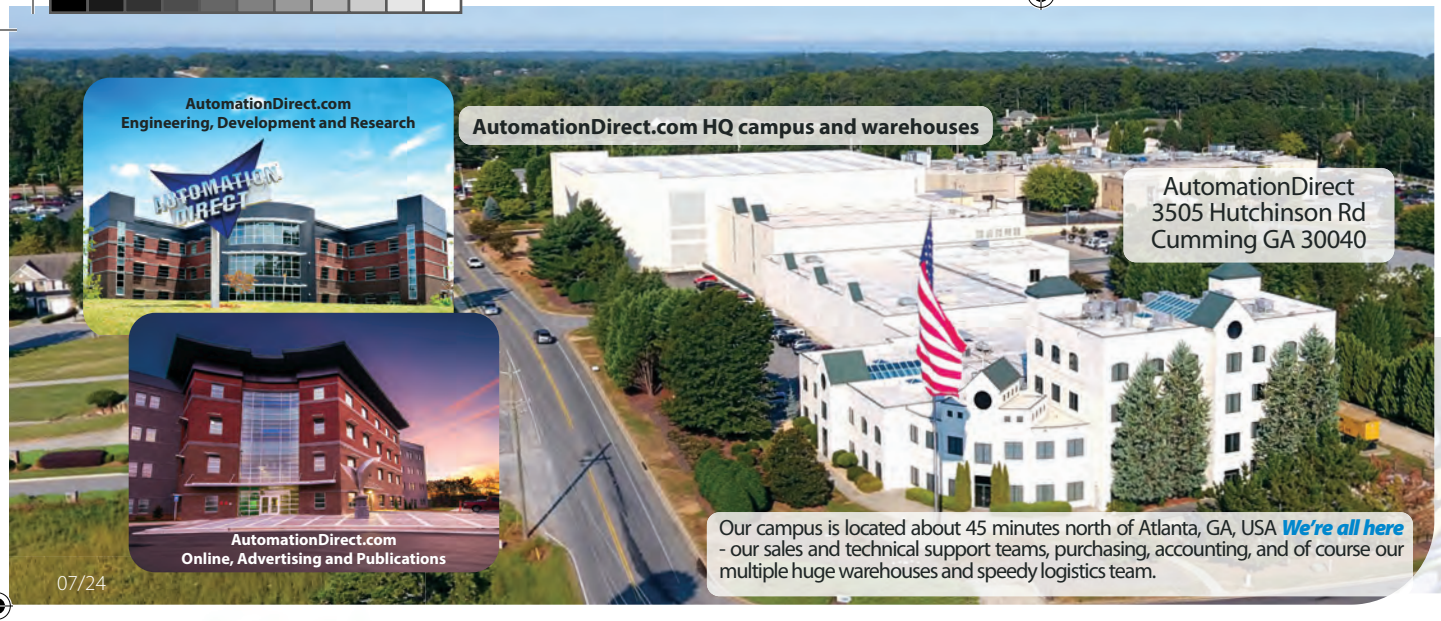

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