

# Chameleon Programmable Automation Controllers (PAC)



## Rugged, Durable, and Reliable Platform for Mission-Critical Applications

Chameleon is a family of industrial control, communication, and power modules that integrate seamlessly to form a high-performance Programmable Automation Controller (PAC). Chameleon PACs offer multi-domain functionality—including logic, motion, and process control—on a single very flexible and highly configurable platform. The Chameleon solution completely blurs the line between the discrete-oriented functionality of traditional Programmable Logic Controllers (PLCs) and the process-oriented functionality of Distributed Control Systems (DCS) and loop controllers.



Chameleon's modular architecture allows the selection of hardware capabilities to strictly match the specific requirements of a particular application without compromising future expansion needs. You can buy only the equipment you need when you need it.

The Chameleon solution is unique in that nearly every module in the product family is equipped with its own processor and dedicated memory space. Each module is powered by a 32-bit processor with on-board RAM and non-volatile flash memory. This means processing power and memory storage capacity grows proportionally with I/O, networking, and user-interface capabilities. Competing modular solutions usually require that you build a device by selecting a single main processing module, a single power module, various optional expansion I/O modules, and a single optional networking module. With this arrangement, the single processing module bears an increasing computational burden as modules are added, since the aggregate device cannot have multiple processing modules working in parallel.

The Chameleon architecture not only provides computational and storage resources that grow with application demands; it is also more robust to component failures by distributing the processing load. If the single processing module in a competing solution fails, the entire device is rendered useless. By contrast, if a Chameleon module fails, only the hardware resources contained within that module become inaccessible. Other modules can continue executing without interruption since they contain their own processing and I/O capabilities. In addition, neighboring Chameleon modules can be configured to execute redundant algorithms, so if one module fails another can take over its control functions. Modules support both redundant input and redundant output connections. In addition, Chameleon PACs can be equipped with multiple power modules to offer redundancy in power sources—both to the PAC and to the external devices that it powers. In competing modular systems, the power module often represents a single-point of failure because it can't operate in parallel with other backup power modules.

Chameleon modules integrate seamlessly with one another by sharing information over a common high-speed data bus. This internal data network makes any module's hardware resources (e.g., inputs, outputs, displays, buttons, etc.) available to all other adjoined modules. In fact, any signal or variable computed in one module's processor is easily accessible by other module processors. All signal synchronization between processors is handled in firmware and is completely transparent to the user. The multi-processor architecture facilitates parallel task execution without complicating the programming effort. In fact, it often simplifies programming and configuration by naturally grouping I/O and user-interface resources with computational resources.

### KEY FEATURES

- Proven technology in demanding field applications
- Extremely flexible and modular architecture with versatile I/O suite
- Rugged and tough: unparalleled environmental protection
- Third-generation graphical programming software with familiar function block, state-transition, and ladder-logic diagrams
- Platform independent programming and configuration facilitates code reuse
- Programs can be uploaded from field devices for modification in the field
- Supports redundant input and output connections and redundant power sources
- Floating-point arithmetic, including trigonometric, logarithmic, and exponential functions
- Built-in data logging features, including event-triggered signal snapshots
- Wireless device configuration and data retrieval
- Support for various de-facto industrial networking standards
- Embedded web-server, e-mail server, and OPC server
- Easy to assemble, install, and maintain
- All modules are hot-swappable...no need for process shutdown
- Modules can be replaced without disturbing wiring connections
- Fully-configurable user-interface with prominent displays and buttons with tag-holders for signal/function labeling

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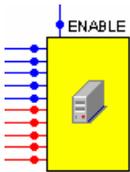
## Rugged, Durable, and Reliable Platform for Mission-Critical Applications

### FULL NETWORKING SUPPORT

Chameleon embraces device-level networking and decentralized automation architectures, and enables data exchange between multi-vendor systems. Several modules are now in development to support a variety of industry-standard open networking protocols, including Ethernet IP, DeviceNET, ModBus, ProfiBus, LonTalk, and others. The flexibility of the Chameleon architecture permits networking modules to work in parallel as routers or bridges between disparate network segments. Module combinations can serve as a gateway between different protocols, using the internal high-speed backplane network to translate data from one protocol format to another. Networking modules using the same protocol can also be combined to provide isolation between network segments and improve overall system reliability.

Chameleon networking modules also provide enterprise connectivity and integration. For instance, the Chameleon Ethernet module includes an embedded web-server, e-mail server, and OPC server. The web-server provides anywhere/anytime secure data access with ubiquitous web browser software. The e-mail server can be configured to send event-triggered e-mail alerts and can be programmed to process remote commands embedded in the e-mail messages it receives. The embedded OPC server supports the industry-standard OPC (OLE for Process Control) protocol and provides a direct link to widely used HMI/SCADA software applications.

### BUILT-IN DATA LOGGING FEATURES



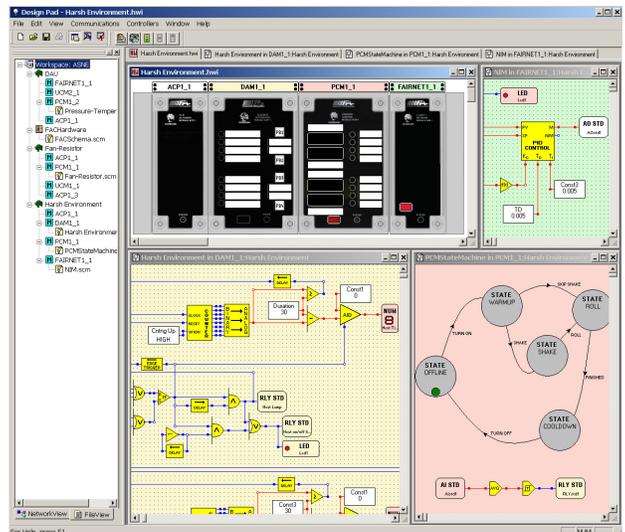
Chameleon modules have sufficient onboard memory and processing power to simultaneously perform control functions and store data. Modules can log any number of user-selected signals at user-configured time-intervals. They can record data continuously (loop recorder mode) or for brief time periods triggered by user-defined events or conditions (snapshot mode). In snapshot mode, modules can record signals both before and after the triggering event occurs. Data can subsequently be retrieved for analysis over a wireless link or network interface.

### INTUITIVE DEVICE PROGRAMMING AND CONFIGURATION

Chameleon devices are configured with Fairmount Automation's *Design Pad G3* software package. Design Pad provides an intuitive graphical programming environment to implement sophisticated control algorithms and automation schemes. It includes familiar function block programming capabilities as well as powerful event-driven state-transition diagramming techniques. New features in Design Pad allow design engineers to define operational states, to specify how the device should behave in each state, and to define events that cause transitions from one state to another. Using these features inherently leads to more robust designs by forcing the segregation of automation tasks into manageable subsystems. Engineers can then focus the design effort on the specific functionality required by each subsystem without the distraction of the system at large.

Design Pad G3 emphasizes program reuse by clearly separating the target hardware from the control schemes they are to execute. The same automation program can execute in any module or in any arrangement of modules (provided that the hardware resources referenced by each program are available in the module set). Moreover, the same program can execute in multiple modules at the same time, yet reference the same or different hardware resources. This hardware independence is made possible by dividing control algorithm development from device configuration. The control programs reference *generic* hardware function blocks (e.g., analog input signal) that are subsequently *bound* to specific hardware resources (e.g., analog input channel 3 in the module labeled "Pump C1").

Design Pad projects are also self-documenting since the state diagrams and function block interconnections represent the control specification.



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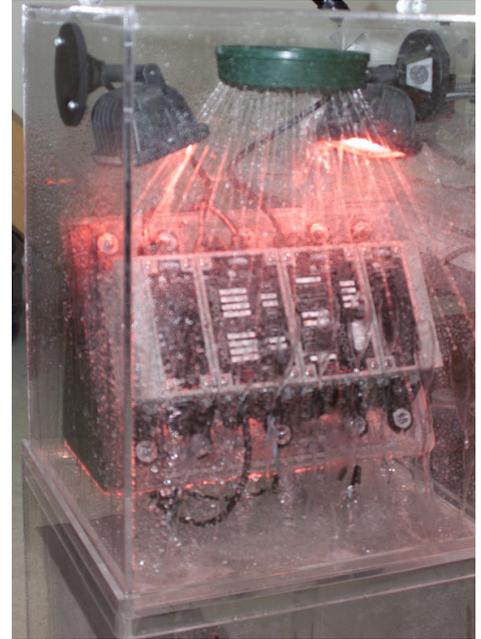
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### UNPARALLELED ENVIRONMENTAL PROTECTION: MOUNT IT VIRTUALLY ANYWHERE

Chameleon products are rugged and tough—capable of operating in the most difficult industrial environments. They are designed to endure high-impact shock, extreme vibration, and electrical power spikes. They can operate over an extended temperature range. And they can be exposed to water, dirt and grit, oil sprays, humidity, corrosion, and other environmental hazards. In fact, Chameleon devices are so rugged that they pass the most stringent U.S. military specifications (MIL-SPECS) for shock, vibration, electro-magnetic interference, and power surges without modification—they do so off the shelf.

### ENCLOSURELESS SOLUTION REDUCES INSTALLATION COSTS

The Chameleon product line is an *enclosureless* solution: it doesn't require the use of third-party enclosures for environmental protection. *Enclosureless* solutions reduce space requirements and equipment weight, and eliminate the added costs associated with enclosure design, fabrication, and assembly. Available user-configurable modules (UCM-1 and UCM-2) allow additional hardware such as switches, buttons, alarms, key-locks, etc., to be seamlessly incorporated into the Chameleon platform. These fully customizable modules are also equipped with terminal connectors and can serve as convenient junction boxes.

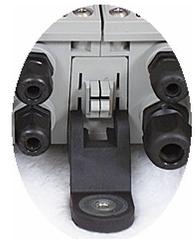


### EASY ASSEMBLY, INSTALLATION, AND MAINTENANCE

Chameleon was designed with an emphasis on ease of assembly, installation, and maintenance. Several mounting alternatives are available, including panel or surface mounting (directly bolted to machinery or equipment), standard DIN-RAIL mounting, and pipe mounting. Optional high-performance mounting *feet* are also available for improved shock and vibration isolation.



Modules snap together using an innovative interlocking design. Mounting components—dubbed *feet*—join adjacent module enclosures to each other and to sealing end-caps; and module covers slide into each individual enclosure. All of the components are keyed to ensure error-free assembly and all component interfaces contain a gasket to fully seal the internal electronics. Every module is equipped with two interconnected electronic boards: one is fastened to the enclosure and the other to the cover. The board mounted in the enclosure serves as a wiring hub; connections made to this hub should rarely (if ever) need to be disconnected (even for device maintenance). The board attached to the module cover contains the *active* controller electronics—microprocessors, memory chips, signal conditioning devices, communication interfaces, and display elements.



While electronic component failures are rare, if one should occur, it will most likely only affect the *active* board. The wiring hub board is populated with components such as connectors that have a negligible probability of failure. This two-board design significantly eases maintenance procedures. If a module should ever fail, an operator can simply replace the top cover (and attached active board) without disengaging and reengaging any wiring connections or even shutting off power to the unit. Since all modules are hot-swappable the device can continue operating without interruption while a module is replaced. The new module doesn't even need to be re-programmed—that will be automatically taken care of by a neighboring module! Every module holds the user-program for all its neighboring modules. When a new module is inserted it will receive its configuration data over the high-speed backplane network.