

Programmable Automation Controllers (PACs)

For many years, programmable logic controllers (PLCs) have provided OEMs and end users with a highly reliable method of control. However, engineers working with PLCs have to plan for generational upgrades to achieve greater functionality and improve their control system's ability to communicate beyond the plant floor. Now, a new type of control system, called programmable automation controllers (PACs), offers significantly more flexibility, openness and performance. PACs allow users to make a leap in capability without re-engineering. Featuring a portable control engine that sits on top of the operating system, PACs also give users the ability to maximize the benefits of their application first and optimize the automation platform second.



Programmable Automation Controllers (PACs)

The innovative PACSystems® family from GE Fanuc Automation, which addresses the industry-wide need for a PAC platform, is the controller environment that provides a leap in performance without the historical burden of migration path and conversion. PACSystems features a single control engine and universal programming environment as well as portability across multiple hardware platforms to deliver a true convergence of control choices.

The Need for PACs

PLCs have been the control solution of choice for more than two decades, delivering the speed and reliability necessary in industrial applications, rugged design for demanding plant environments and proven performance. While not issues in the past, these controllers are built on proprietary architectures, and are designed for programming and implementation in a specific application. Communication beyond the plant levels of the enterprise – the device, control and supervisory tiers – can often require a generational upgrade.

In recent years, however, many organizations have sought to integrate disparate plant floor equipment and networking systems, and to connect them to operations and enterprise-level systems and processes. This level of integration promises many business benefits, including:

- Enabling the operational excellence that allows companies to build superior products, achieve profits and grow the business
- Combining lean manufacturing with more agile processes to cut waste and respond to market variability
- Strengthening and enhancing core competencies to more clearly define and market the business
- Designing and building products at any location to extend the product lifecycle globally;
- Adopting common, standards-based architectures to keep costs down
- Preserving assets to help maintain profitability.

Traditional control solutions do not allow the level of openness and flexibility required to deliver these desired benefits often because numerous platforms and systems must be deployed to automate the entire enterprise. Enabling interoperability and information exchange among these pieces of equipment and systems can be a challenge, if not impossible in some cases.

In this new model, traditional control systems have the following limitations:

- Control system implementation may not be fast or easy due to multiple platforms from different vendors, all requiring different programming for discrete, process and motion logic
- While recognizing the value of implementing the latest

automation control technologies, users may be hesitant to adopt these technologies and products for fear that they will become obsolete

- The time and expense to re-engineer an existing system might not be offset by the benefits of the upgraded system's capabilities
- Current automation systems can often have difficulty keeping pace with the need to accommodate ever-increasing quantities of data
- The quantity of development, user and engineering tools and platforms can be overwhelming, leading to extensive delays in specifying and implementing automation systems, and incurring steep training costs
- Once it's finally up and running, a specific control system may perform well in one application; however, successfully adapting it to another one can often prove difficult

Given these limitations, the functionality of PLCs has been expanding during recent years to provide greater application flexibility and interoperability. However, most PLC manufacturers haven't adequately defined and positioned their controllers in this evolutionary role or sought to extend the functionality of these proven industry workhorses to transform them into more revolutionary solutions—until now.

Defining PACs

Powered by a single, portable control engine and using a single development tool for multiple applications, PACs enable true control convergence and integration of plant floor operations with business systems, rather than a mere, less-than-seamless connection of disparate parts and pieces.

PACs are defined by the following features and capabilities:

- Multi-domain functionality – including logic, motion, HMI and process control – on a single platform
- A common development platform for the design and integration of multi-domain automated systems
- Allowing OEMs and end users to deploy multiple control applications on a single platform
- Facilitating open, modular control architectures that enable highly distributed automated plant environments
- Employing de facto standards for network interfaces, languages, etc., to allow data exchange as part of networked multi-vendor systems

While a PAC's form factor can be similar to that of a traditional PLC, a PAC's capabilities are far more comprehensive. PACs are multi-functional controller platforms that encompass various technologies and products that users can mix, match and implement at will. PLCs, on the other hand, are products grounded in proprietary architectures that are equipped with the capabilities that the manufacturer deems necessary.

The primary differentiator between the two is the foundation upon which each is based. Whereas a PLC's capabilities are grounded in specific hardware and cannot be moved easily from PLC to PLC, a PAC's functionality is rooted in its portable control engine. Each application interfaces with this engine, which sits on top of the user's operating system of choice, with few changes required to move applications from system to system. Since the engine is separate from the hardware and uses a common operating system, the platform can grow and change as rapidly as user needs demand.

From an applications standpoint, while traditional PLCs are strong in discrete control but can be weaker in other areas, users can develop and implement discrete, process and motion control applications from the PAC's single platform with equal agility and reliability.

And, while PLCs are built on proprietary technologies, PACs make extensive use of COTS (Commercial Off The Shelf) products and technologies, which:

- Help ensure reliability and availability of systems because hardware and software can be maintained quickly and easily
- Reduce system price and downtime because they are readily available off the shelf
- Increase openness, flexibility and scalability

Benefits of PACs

A PAC control solution, such as GE Fanuc's PACSystems, delivers the benefits that both plants and OEMs need, including:

- Increasing productivity and operational efficiency
 - A single portable control engine and universal engineering development environment allows rapid development, implementation and migration
 - Through its openness and flexibility, enables true control convergence and seamless integration with operations and enterprise-level business systems to streamline plant processes
- Reducing operational costs by
 - Employing common, standards-based architectures and networks
 - Enabling engineers to choose different system components for a platform that uses cost-effective COTS rather than proprietary products and technologies
 - Requiring user training on only one platform and development environment, rather than several
 - Providing a seamless migration path that protects investments in both I/O and applications development.

- Giving users more control and flexibility over their control systems
 - PACSystems provides users with the flexibility to choose the hardware and programming language that best suits each particular application
 - Design upgrades on users' own timetables
 - Design and build products at any location.

The PACSystems Solution

The new GE Fanuc PACSystems family features a control engine that is built on standard embedded architecture with commercial deterministic operating systems, making the engine portable to multiple platforms and allowing users to choose the hardware and programming language that best suits each particular application. The system supports distributed I/O through such standards-based communications as Ethernet, Profibus™, DeviceNet™ and Genius® networks.

PACSystems is driven by GE Fanuc's Proficy® Machine Edition development software, which provides a universal engineering development environment for programming, configuration and diagnostics. Users can develop a control program with the easy-to-use Windows®-based software and apply it to the system of their choice. With tag-based programming, a library of reusable code and a test edit mode for improved online troubleshooting, Proficy Machine Edition is a user-friendly environment that can increase design flexibility and improve engineering efficiency and productivity.

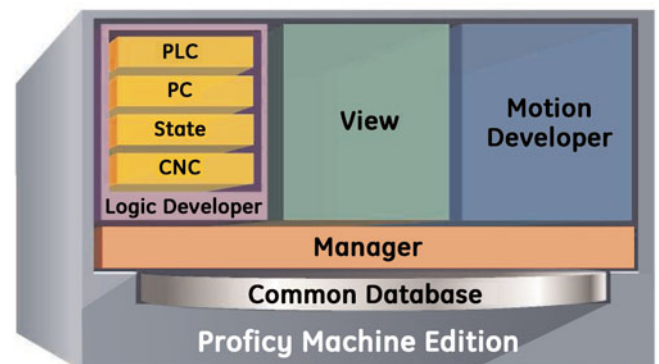


Figure 1
Proficy Machine Edition software provides a single, integrated development environment for machine-level programming, monitoring and data acquisition, and troubleshooting.

Programmable Automation Controllers (PACs)

GE Fanuc's PACSystems line consists of the following controllers, each of which provides different application benefits:

- The industrial PC, an all-in-one display panel and full industrial PC
- Plug-in cards for the PCI bus and for the VME bus that offer standard interfaces to a wide variety of devices
- The VME64-based RX7i, which supports all standard VME modules, including Series 90™-70 I/O and VMIC modules
- The RX3i, which provides high-speed PCI bus data transfer rates and further extends functionality supporting Series 90-30 I/O modules.

The RX7i and RX3i

Available now, the high-performance RX7i is the first release in the GE Fanuc PACSystems family. Offering four times the speed of existing PLC backplanes and up to 10 MB of memory usable for programming and documentation storage, the PACSystems RX7i is VME64 based, supports all standard VME modules (including Series 90™-70 I/O), incorporates industry-leading embedded systems technology, and uses either an Intel Pentium III 300 MHz or 700 MHz CPU.



Figure 2
The PACSystems RX7i offers four times the speed of existing PLC backplanes.

The RX3i features:

- Faster throughput and high speed processor without information bottlenecks using a patented technology Dual backplane bus support per module slot
 - High-speed, PCI-based for fast throughput of new advanced I/O
 - Serial backplane for easy migration of existing Series 90-30 I/O
- Celeron (Pentium® III) 300 MHz CPU for advanced programming and performance with 10 MB of memory
- Users can store ladder logic documentation and machine documentation (Word, Excel, PDF, CAD and other files) in the controller to reduce downtime and improve trouble shooting.
- Open communications support including Ethernet, GENIUS, Profibus, DeviceNet and serial communications
- Supports high density discrete I/O, universal analog (TC, RTD, Strain Guage, Voltage and Current configurable per channel), isolated analog, high-density analog, high-speed counter, and motion modules
- Expanded I/O offering with extended features for faster processing, advanced diagnostics and a variety of configurable interrupts
- Hot insertion for both new and migrated modules
- Isolated 24VDC terminal for I/O modules and a grounding bar that reduces user wiring

Future Offerings

To continue providing users with the most leading-edge technology in a wide range of form factors, GE Fanuc plans to introduce additional PACSystems modules. In addition to releasing the industrial PC and plug-in cards for the PCI bus and VME bus, enhancements to the line will include multiple controllers, interrupt support for the RX3i, CPU redundancy using reflective memory technology (high-speed memory exchange), and other functionality.

For more information about PACs and GE Fanuc's PACSystems, visit: www.gefanuc.com/PAC

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Additional Resources

For more information, please visit the GE Fanuc web site at:

www.gefanuc.com

