

GE
Intelligent Platforms



PACSystems



imagination at work

Simplify your control environment

GE's revolutionary PACSystems controller provides a unique architecture that combines flexibility, openness and performance for a sustainable competitive advantage.

As automation systems grow in size and complexity, it is increasingly important to simplify your control structure. The ability to integrate disparate plant floor equipment and networking systems, and connect them to your operations and enterprise-level systems and processes provides a distinct advantage over manually collecting and analyzing data.

Unlike disparate PLC systems, which are limited in terms of scalability or adaptability, a programmable automation controller can bring you freedom and flexibility. GE Intelligent Platforms' PACSystems* controller enables you to take control by providing real-time connectivity and integration—greatly simplifying your production processes for success today and growth tomorrow.

With PACSystems, you can consolidate your controls disciplines on the same scalable, standards-based platforms for more rapid implementation, faster time to market and increased ROI.

PACSystems—The convergence of control

PACSystems offers a unique multi-domain functionality—including logic, motion, HMI, and process control on a single platform. It features a common development platform driven by Proficy* Machine Edition development software, which allows speedy and seamless migration while enabling communication beyond the plant floor to all areas of your enterprise.

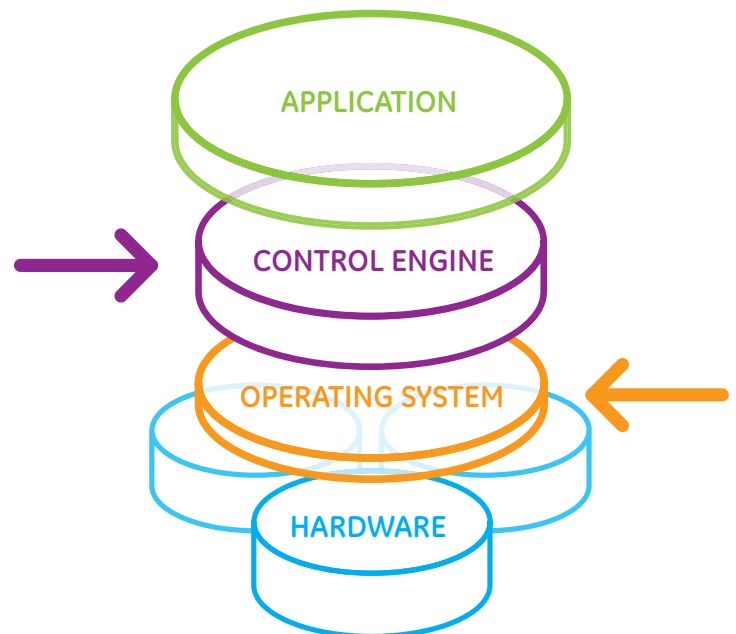
Maximize your assets

PACSystems delivers the flexibility and openness you need to protect your current investments, while providing a path to upgrade and embrace new technologies that can help set you apart from competitors. Featuring open communications protocols, PACSystems allows you to connect seamlessly and expand your systems on your terms—all while utilizing most of the existing equipment and intellectual property you have developed in your programs.

Leverage a new control structure

The heart of PACSystems is a portable control engine that can handle multiple hardware platforms, including those that will be developed in the future. The control engine sits on the operating system of choice, and the application interfaces with this engine, making the engine separate from the hardware and the application portable.

Using a commercial operating system, the platforms can grow as rapidly as the technology allows, and few changes are needed to move applications from system to system. As a result, you can design, implement and maintain your system with freedom like never before.



What do you want from a PAC solution?

Imagine a controller that could be programmed to handle process, discrete and motion. Or any combination of the three. Or, simply whatever you need— all on the same processor. Imagine if you could put that controller in multiple platforms and always guarantee the same execution, regardless of the platform on which it is running. Now, imagine how that might change your business.

PACSystems enables unprecedented flexibility in your control environment, featuring a common engine that allows you to take programs that are created in one controller and easily move them to another.

Get the results you need

Regardless of your industry, you are charged with delivering results to your business. PACSystems helps you do that, delivering real results across your operations, your plant and your enterprise.

The PACSystems high-speed processor is a patented technology that delivers faster throughput without information bottlenecks. The result is a faster time to market because of integrated control disciplines, fewer resources and less training.

The freedom to define the control you want

Imagine the freedom to define a control strategy that meets your needs— simply and cost effectively. PACSystems enables your engineers to choose different system components for a platform that uses cost-effective commercial off the shelf technologies rather than proprietary products, and drives down the cost of your system. Plus, it allows you to implement the features and functionality that make the most sense for you, while connecting to existing technologies in your plant. And because it is built on standards-based platforms, PACSystems helps make sure you are not tied down and restricted to a single set of protocols.

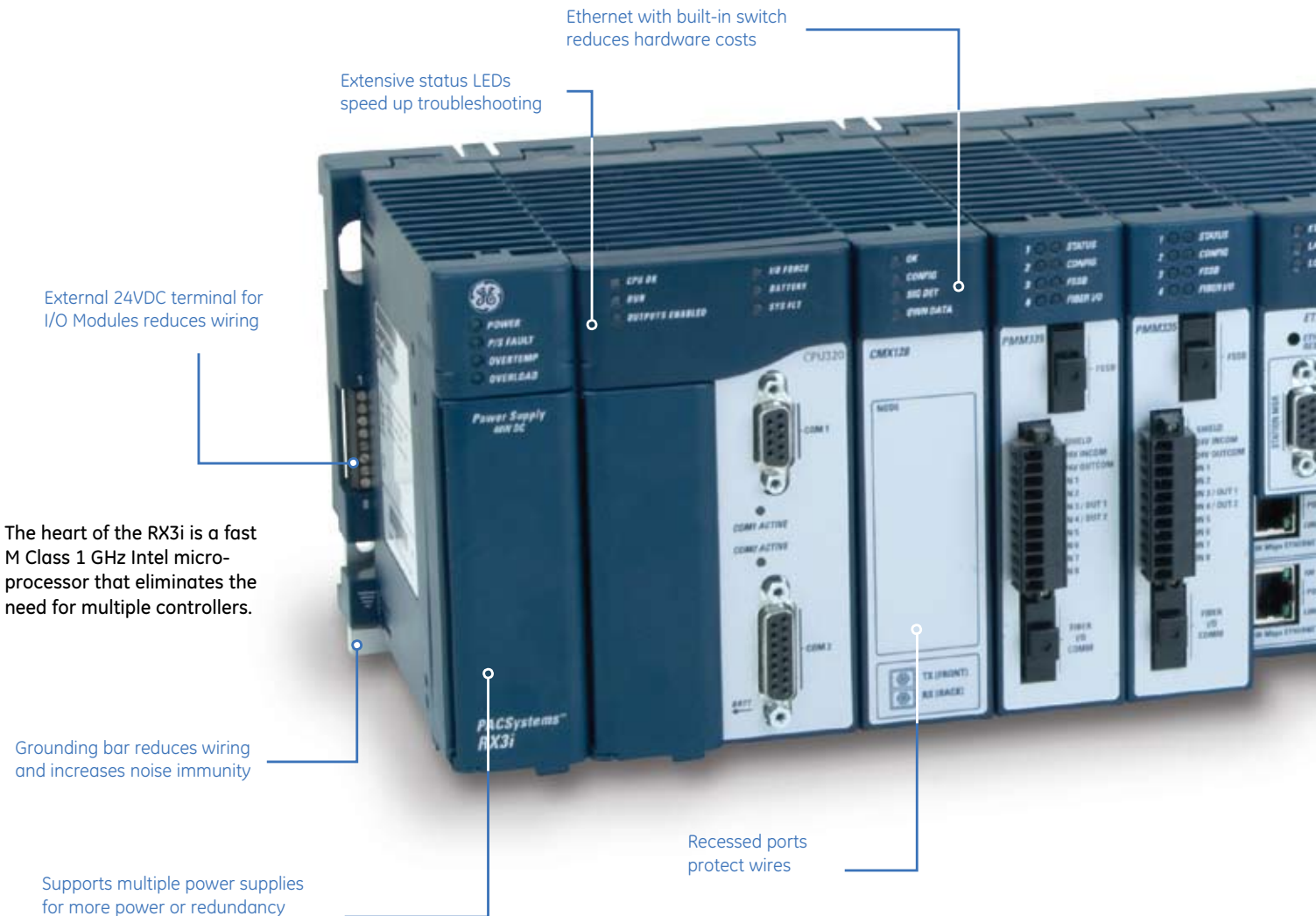


At the Heart of the RX3i PACkage

PACSystems RX3i contains all the elements needed to achieve more powerful, flexible, and cost-effective control than you've ever thought possible.

To ensure a wide range of functionality, the RX3i comes with either 10 MB or 64 MB of user memory. You can store all your ladder logic documentation as well as machine documentation (including Word, Adobe Acrobat, Excel, and CAD files), aiding troubleshooting and sharply reducing downtime.

The RX3i provides the best of both worlds—a high-speed PCI bus running at 27 MHz for fast data throughput for complex I/O and a serial bus for simple I/O.



Extensive status LEDs speed up troubleshooting

Ethernet with built-in switch reduces hardware costs

External 24VDC terminal for I/O Modules reduces wiring

The heart of the RX3i is a fast M Class 1 GHz Intel micro-processor that eliminates the need for multiple controllers.

Grounding bar reduces wiring and increases noise immunity

Supports multiple power supplies for more power or redundancy

Recessed ports protect wires

The RX3i supports GENIUS[®], Profibus[™], CMX, Hart, DeviceNet[™], serial communications—and of course Ethernet with multiple protocols.

The RX3i supports bumpless high availability solutions with reflective memory technologies using standard hardware and software when uptime is critical and repair costs are high.

Where you might see a PACSystems RX3i

Built with enough versatility to handle most applications, the RX3i thrives when it can show off its portable control engine. The PACSystems RX3i offers a high level of automation functionality in a compact, cost-effective package. The PACSystems portable control engine provides high performance on several different platforms, allowing OEMs and end users with application variability to choose the exact control system hardware that best suits their needs.

Migration—protecting your hardware and intellectual property investment

PACSystems is designed to allow applications to move easily from system to system with little or no changes required, giving it the most seamless migration path in the industry. New features are developed once, then deployed in multiple places. With control technology that is built on standard embedded architecture, PACSystems is able to implement identical code execution regardless of platform for consistent, deterministic operation. As a result, you'll enjoy a seamless migration path for I/O and programming while keeping your platform footprint and leveraging your installed automation investment.

The CMX technology enables high speed data sharing over 2.12 gigabaud fiber deterministic network. Sharing data has never been easier.

Hot swap modules reduce downtime



Tie wraps to secure wires

Cost competitive expansion modules

You can select from more than 60 I/O and network modules, making the RX3i ideal for a variety of simple to complex applications. Local and distributed I/O are both supported.

At the Heart of the RX7i PACkage

PACSystems RX7i powers some of the most demanding and intensive control solutions in the world.

Built on a standard embedded open architecture, the PACSystems RX7i is the first member of the groundbreaking PACSystems family. Like the rest of the PAC family, the RX7i features a single control engine and a universal programming environment to provide application portability across multiple hardware platforms, creating a seamless migration path.

PACSystems RX7i High Availability

A PACSystems High Availability solution provides synchronized redundancy for any module in your control chain capable of bringing your operation to a halt. Should any part of your system fail, its backup counterpart automatically assumes control, ensuring that any process continues without costly production losses.

The controllers incorporate dedicated and redundant links to one another and operate synchronously, transferring all the application's variables, status, and I/O data with each sweep.

The VME64 Backplane handles huge amounts of data (up to 14Mb/sec) for the most demanding applications.

10/100 Ethernet built into the CPU

High capacity power supplies (100W and 350W) to reduce the requirement for an external supply

Up to 64 MB memory for fast execution and storage of the complete program with all documentation on the CPU



The heart of the RX7i is a powerful Pentium CPU for your every need, from Celeron 300 mHz all the way to the super duty M Class 1.8 Ghz for those incredibly intensive applications.

Where you might see a PACSystems RX7i

With the VME standard, there are over 3000 modules available from vendors in addition to the wide variety GE provides, including specialty analog and discrete modules with built in SOE, single board computers, to name a few.



Easiest migration path in the industry, supporting the programming and boards of the Series 90-70

Web server access with user defined pages

Connectivity to globally accepted communications: Ethernet, GENIUS, Profibus and DeviceNet

Object Oriented programming through IEC languages including C, Ladder Logic, Function Block Diagrams, Instruction List, and Structured Text for fast executing, standards based applications

The integration of Control Memory Xchange, a high-speed global memory over a fiber network, brings an unparalleled level of speed and accuracy. The high-speed memory-to-memory communication allows 2.12 gigabaud communication with no software overhead.

Designed to address high-end and mid-range applications for OEMs, integrators and end users, the RX7i is ideally suited for integrated solutions that require open architecture, large memory, distributed I/O and high performance. Its unique advantages including high availability, redundancy, and seamless migration from existing systems bring the control needed in high performance applications.

Migration—protecting your intellectual property and application investment

With PACSystems, you never have to worry about being stuck with old hardware again. We make migration a competitive advantage rather than an anchor on productivity. The RX7i supports the existing Series 90-70 modules, expansion racks, VME modules and GENIUS networks so that you can protect your hardware investment. The RX7i even fits into the same overall controller footprint as the Series 90-70. In fact, up to 80% of your hardware can be carried forward as you upgrade to a programmable automation controller. Not only that, but there is a seamless conversion of Series 90-70 programs for the complete protection of your application investment. We will be there to help you be at the cutting edge of automation.

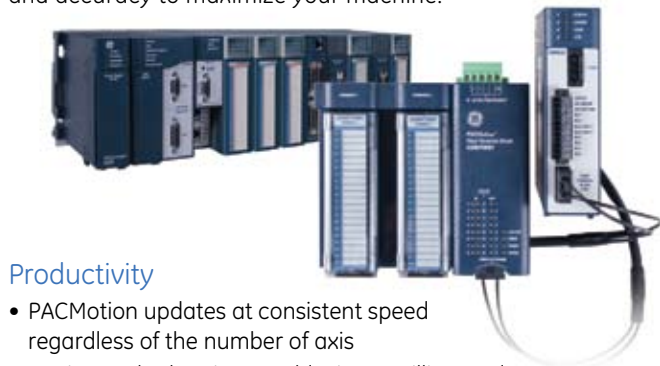
The Complete System

It's not simply that PACSystems RX3i contains all the elements needed to achieve more powerful, flexible, and cost-effective control. It's the way they have been integrated into a single, unified package that makes the difference.

PACMotion maximizes the potential of your machine so that you can sell more. When you have high performance needs that include high-speed motion applications, PACMotion provides the performance, flexibility, and productivity to make the most for your customers. PACMotion is a revolutionary new motion controller for the PACSystems RX3i, breaking the mold of what a motion controller can do. It controls up to 40 axes in a single rack over a high-speed backplane, with a hybrid distributed control architecture to ensure you get the speed and accuracy to maximize your machine.



Open and Connected. The QuickPanel[®] View bundled visualization solution will connect with PACSystems and other control platforms to give you the tools needed for today's application needs.



Productivity

- PACMotion updates at consistent speed regardless of the number of axis
- Motion path planning at a blazing 1 millisecond
- Position loop update occurs every 500 microseconds
- Axes are updated simultaneously to eliminate phase delays
- Distributed control architecture keeps the processing load off of the main processor so to ensure consistent performance at high speeds and high axis counts
- Fiber Optic I/O for noise immunity increases reliability

Flexibility

- Flexible configuration with master axis, I/O, architecture
- Centralized or distributed control
- On the fly changes make it easy to do short production runs
- Amplifiers can be centrally located or located up to 400m from rack
- A flexible master position source easily configures any axis to be a master or a slave to any other

Engineering Productivity for Quicker Time to Market

- Integrating the motion and logic onto one system reduces complexity
- A common programming language, tag database, and function blocks allows faster program development and time to market and machine commissioning
- More than 50 built-in motion functions
- Designed to comply with PLC Open standards



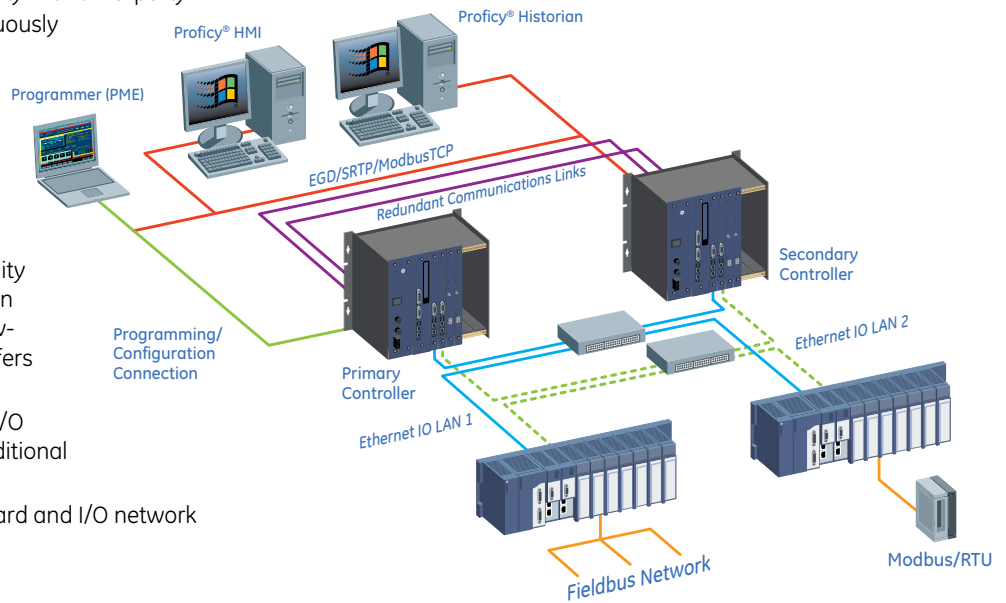
A Wide Range of Communications Options for Your System

We know that there are many different communications options out there, which is why we offer the ability to connect with so many of them. PACSystems is open about its communications. Some of the options include:

Ethernet

The use of Ethernet technology in a solution offers strong benefits to end users. High availability systems running on Ethernet mitigate the risks of down time, safety concerns and reduce the total cost of ownership. Being an open standard, customers will benefit from the easy interoperability with third-party devices. Ethernet technology is continuously evolving, and since Ethernet is a mass-market technology, compared to proprietary network technologies, users can benefit from the cost advantages offered by COTS Ethernet infrastructure components.

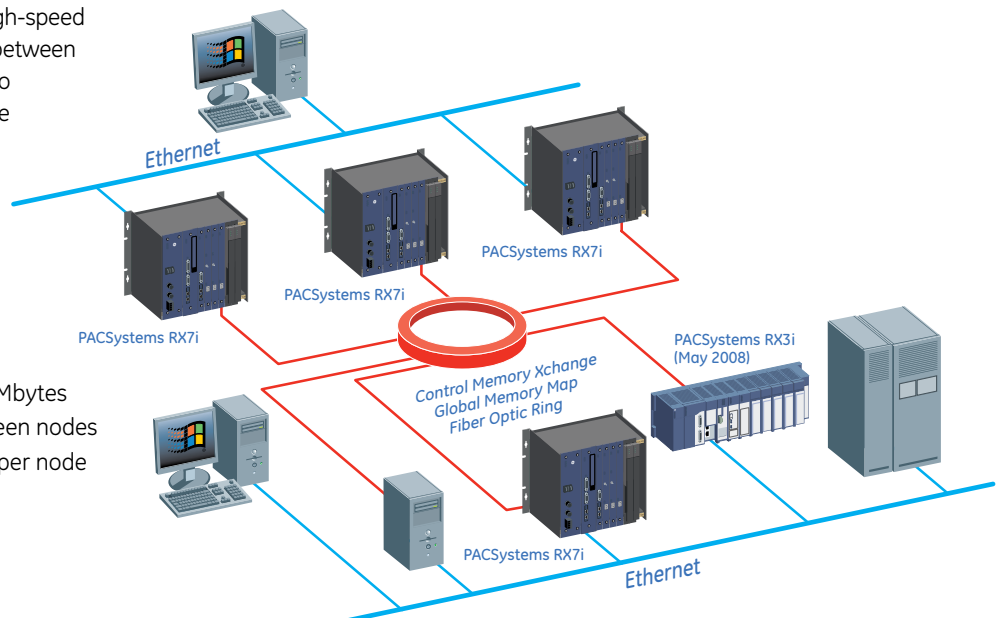
- With GE's "All Ethernet High-Availability Solution," I/O, Control, and SCADA can be on a homogeneous network allowing fast and high-volume data transfers between automation layers.
- It also allows management of large I/O based systems (10,000+) without additional investment in control system.
- 100 Mbps IEEE 802.3 Ethernet standard and I/O network



Control Memory Xchange

When the speed of operation is absolutely essential, GE's Control Memory Xchange solves the problem. In applications that need to transfer huge amounts of data, operate in high noise areas, or cover large distances in real time, Control Memory Xchange is unique in its abilities. Its high-speed memory-to-memory communication between multiple distributed systems allows it to operate like shared memory on a wire with no software overhead. Each network node has a local copy of all the data, and data can be shared among systems regardless of processor type, operating system, and bus structure.

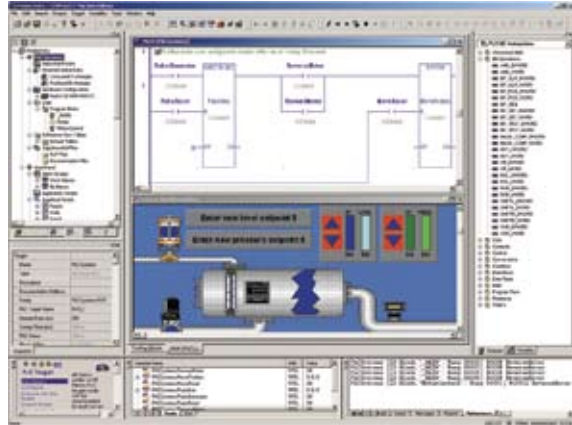
- 2.12 gigabaud
- Transfer rates of 43 Mbytes to 174 Mbytes
- Multi-mode fiber up to 300 m between nodes
- 128 megabytes of shared memory per node



The Cornerstone of the System

Proficy Machine Edition: A Single Integrated Programming Environment

Proficy Machine Edition provides one tool for control, view, and motion and gives you one universal engineering development environment for all programming, configuration, and diagnostics, resulting in faster time to solution, reduced training, and more compact, efficient design.



- All Proficy Machine Edition components— view, logic, and motion— share a common database and common objects across applications, including logic, scripts, and animation. Once a variable is created, it can easily be used in all other domains of the application.
- At the same time, Proficy Machine Edition components share common development tools. Proficy Machine Edition features a common user interface, drag-and-drop editing, and takes full advantage of industry-standard technologies like XML, COM/DCOM, OPC and ActiveX.
- Proficy Logic Developer supports IEC languages such as Ladder Diagram, Instruction List, Structured Text, Function Block Diagram, and SFC. In addition, C programming is available.

This tight integration of Proficy Machine Edition components in a single, shared workspace means control engineers spend less time on the learning curve. And that translates into higher operating efficiency and lower development costs.



View

Proficy View— the graphical interface component of Proficy Machine Edition, is an intuitive, machine-level HMI for machine control and small process control applications. It supports GE's full line of operator interface products, providing complete scalability from the smallest operator interfaces to full-size HMI applications.

- A Complete Set of Functions: From data collection and trending to system security and alarming, View delivers a complete set of features that enables you to configure and program an application with ease.
- Data publishing via the Internet on any standard web browser
- A toolchest with over 2,000 preconfigured objects: Simply click the objects you want and drag them to your graphical panel for editing.
- Complete Runtime Tools: Choose from three types of alarms, create as many alarm windows as you like, view trending in real-time or historical contexts, and monitor customized data watch lists.



Motion

With Proficy Logic Developer, you can develop motion control programs for GE embedded motion controllers quickly and efficiently.

Proficy Logic Developer features include:

- Shared tag database for motion, machine logic and view applications
- Powerful cam profiles can be developed with the graphical cam editor using first, second or third order spline interpolation
- Powerful local logic program editor for logical decisions that are synchronized at the servo position update rate
- All programs and configurations are stored as a part of the CPU configuration

The Power of Object-Based Programming

Object-based programming allows users the power of a true programming environment to easily add functionality and simplify complexity.

- Create unique instances of User Defined Function Blocks
- Objects for Logic, Motion, HMI
- Distributed collaboration

Successful PAC Solutions

Companies in varied industries such as packaging, automotive, woodworking, and water/wastewater are all taking advantage of benefits enabled by the PACSystems' convergence of control.



Power to the Paper – Alstom Power

When a major paper manufacturer needed to overhaul an aging turbine generator for one of its mills, they selected Alstom Power. And Alstom Power turned to GE for a fast, reliable and efficient migration using the PACSystems RX7i control system.

Using a single development tool for multiple applications, PACSystems provided a unique way to seamlessly migrate the plant's existing design to a new controller platform. As a result, Alstom was able to choose the controller that best suited their application, providing a major improvement in overall system performance while allowing the plant to continue leveraging its current investments. Now the plant is operating at peak efficiency, featuring:

- Nearly 100% uptime in power generation
- Reduced maintenance and spare parts costs
- Significantly reduced cycle times with faster data synchronization
- Optimized turbine start-ups and performance
- Improved diagnostics and reporting features



Solutions for Quality – Shanghai GM

Shanghai GM is the biggest and most successful automotive joint venture in China's fast developing automotive industry. To meet increasing demands, they decided to build a new engine manufacturing line, the L850, for use in the popular Shanghai GM vehicle brands.

Shanghai GM specified a highly automated solution divided into multiple assembly zones, consisting of multiple automatic, manual and re-work assembly stations utilizing industrial Ethernet for HMI communications, Profibus I/O for machine control, Profibus DPV1 for RFID communications and high-speed digital servo motion for part manipulation.

GE's PACSystems RX3i was selected as the controller of choice for this application. The PACSystems RX3i Pentium III processor, 10 Mbytes of memory, Ethernet and Profibus network support provided the required system performance. The RX3i high-speed DSM324i modules delivered the required Digital Servo Motion control. Coupled with the advanced programming capabilities provided by Proficy Machine Edition, the PACSystems RX3i provided the right solution for this project.

"The hardware and large amount of memory in the new system from GE is very powerful for complex process handling and improved processing speed."

– Mr. Lijia Yang, Electrics Control Engineer, Powertrain, Shanghai GM



Forging Ahead – Handan and Jinxi Steel

Steel mills in China are seeing a boom in demand while at the same time shifting their focus from pure output to profitability. The demand for quality is also increasing and requires improved accuracy of thickness and width, and better mechanical performance in terms of hardness and tenacity.

Automation of the rolling processes in a steel mill now requires higher speed, greater performance and quicker communication. A control system has to be multi-functional and fast. Different functions have to work together closely and connect to third party devices.

To meet these needs, Handan and Jinxi Steel turned to GE and PACSystems for their hot rolling strip steel applications. The travel speed of the steel from stand to stand, pressurized systems and critical temperatures must all be monitored and controlled. The PACSystems RX7i provides the traditional controller functions as well as several other tasks, delivering greatly improved processing power for increased productivity. Other PLC applications in the mill now use the PACSystems RX7i as well and exist alongside lines using Series 90-30 PLCs.

Imagine the freedom to do it your way. Learn more about PACSystems and perfect control at: www.ge-ip.com/pac



GE Intelligent Platforms Contact Information

Americas: **1 800 433 2682** or **1 434 978 5100**

Global regional phone numbers are listed by location on our web site at www.ge-ip.com/contact

www.ge-ip.com/pac

©2010 GE Intelligent Platforms, Inc. All rights reserved.
*Trademark of GE Intelligent Platforms, Inc.
All other brands or names are property of their respective holders.

02.10 10M GFA-545C