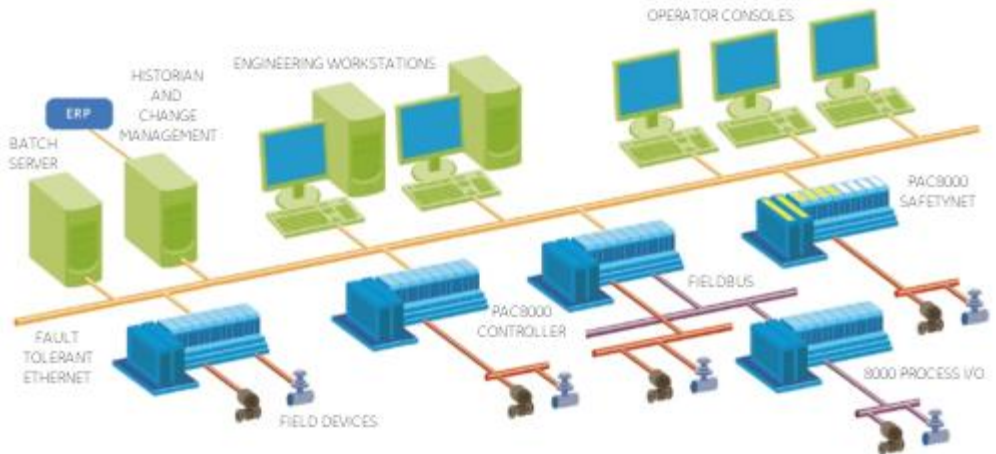


# PAC8000 Process Controller

# 8521-PC-MT

The PAC8000 Process Controller is a rugged, field-mountable control platform intended for those process applications that may have utilized programmable controllers (PLCs) because of their ability to scale to fit smaller applications. Designed for process applications, the PAC8000 Process Controller provides you with an effective alternative to PLC solutions. Combined with the 8000 Process I/O™ system components, it offers cost savings over control room mounted systems as well as flexible system design and high system availability. A PAC8000 Process Control system can utilize any off-the-shelf HMI package.



## Open control platform

The PAC8000 Process Controller executes your control strategies and manages all control activities for the I/O modules. It also manages communications on the control network. The controller has a tight control loop response, rapidly providing a control output in response to input data. The controller incorporates a rigorous redundancy model, fieldbus integration for connecting to HART® and a fault tolerant Ethernet implementation to deliver reliable system operation in your application.

## Applications

The PAC8000 Process Controller, with its process oriented function block programming, is designed to satisfy the process automation market, which includes industries like: power generation and electrical distribution, food and beverage, chemicals and petrochemicals, water and waste water, oil and gas pipelines, cement and pulp and paper.

## Benefits Cost saving solution

The PAC8000 Process Controller takes advantage of Windows 2000 & XP based object-oriented technology, graphical user interfaces and easy to learn software solutions to reduce process control system life cycle expenditures by 30-40%.

## One Step Engineering

The PAC8000 Process Controller eliminates expensive, laborious, and sometimes error prone manual engineering work typically required during control projects. Manual generation of design documents, bill of materials and wiring diagrams is eliminated. Similarly, repetition of advanced control strategies is no longer necessary; eliminating re-entry of program information and

significantly reducing system configuration time. Function block based Workbench software (part number 8459-PC-MT) is used to configure the control strategy. When your application is completed, it can also generate an export table that is used to create the operator interface database for popular HMI packages.

## On-line changes

PAC8000 Process Controllers allow on-line configuration changes during testing, start-up, and maintenance phases. This significantly accelerates system start-up and reduces operation downtime. It is easy to configure the control project in a single step and automatically generate the point database.

## Comprehensive Self-Documentation

PAC8000 Process Controllers automatically generate as-built system documentation including I/O configuration reports, cross reference analysis, bill of materials, instrument index, system start-up, maintenance information and wiring diagrams. Since the drawings are used to develop the control strategy, they are continuously maintained, as the final control strategy is adjusted to an optimum level. You no longer need to update the documentation at the end of the project to assure that it reflects the actual plant configuration; the system drawings are automatically kept current providing you with significant time savings.

## Built-in diagnostics

Extended diagnostics are available to provide module and channel status information, including high and low alarm, open circuit detection and line fault detection at the device level and "fail-safe" perform level.

## PAC8000 Strategy Builder

Logic diagrams are developed using the PAC8000 Strategy Builder. The control strategy is built by selecting the appropriate function blocks, assigning symbolic tags and then connecting the blocks with analog or digital lines using standard drawing forms and commands. SAMA style drawings define all the function and parameters that form a process loop. Function block choices include: manual/ auto station, function-generators, pulse-controller, sequencers, bumpless transfers, PID, etc. Complex control strategies are available, including such as feed forward, cascade and multi-variable control are also supported. Template diagrams can be created and reuses within the current project or another future project.

## Advanced control strategies

PAC8000 Process Control algorithms provide the logic and analytical functions for complex control strategies such as feed forward, cascade and multi-variable control. Adaptive tuning functions for PID control is supported. Two and three state device drivers provide the functionality for motor and valve operations with alarms, remote operation and interlocks. Sequential step functions with interlocks and first out functionality are easily configured.

## Reduced cable costs

Instrumentation cable pairs terminate locally instead of being run across the plant to the control room. Heavy, expensive sensor cables are replaced by the LAN cable.

## High system availability - easy maintenance

Maximize up-time through use of redundant PAC8000 controllers, power supplies and network connections. "Hot swap" modules without affecting system operation or re-configuring even in hazardous areas.



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- powerful, robust controller for advanced control strategies
- PAC8000 Strategy Builder for process control applications
- redundancy with bumpless transfer
- dual-redundant high-speed Ethernet connections
- field mountable in harsh process environments
- peer to peer communications between controllers
- on-line configuration and reconfiguration
- HART® pass-through of process and status variables
- Integrated general-purpose and IS signals



## Controller redundancy

Redundant controllers can be used for critical control applications. The redundant controller pair operates in parallel, checking status multiple times through the processing loop enabling the backup controller to continuously monitor the health of the master controller, assuring a rapid and bumpless transfer to the standby controller.

## Network redundancy

In addition to controller redundancy, the PAC8000 Process Controller has two high-speed Ethernet ports to provide security of communication. Each port can be connected to an independent LAN which is continuously monitored for its integrity. If the primary port detects a network failure, traffic is immediately switched to the other LAN to maintain full communication.

## Executable control programs

The control programs are held in non-volatile memory to enable them to be restored automatically after power cycling of the controller. The use of a redundant controller also enables a new control program to be downloaded to the standby unit while the process continues. When the download has been completed and verified, the standby can be switched to master status to employ the new program.

## Remote Modbus Devices

The PAC8000 Process Controller communicates via Modbus TCP over Ethernet and can operate in either Modbus Master or Modbus Slave mode to communicate with remote Modbus devices. Each controller also has 2 serial ports that can be configured as a Modbus Master to control and obtain information from Modbus Slaves and other serial devices, such as weigh scales, barcode readers, etc. The serial ports can also be configured as a Modbus Slave, accepting write commands from Modbus Master

devices and providing information on its data registers.

## Failsafe and automatic cold start

In the event of complete loss of communication the controller will adopt a user-defined failsafe mode and similarly instruct the I/O to take up user-defined failsafe values. In the event of power loss the PAC8000 Process Controller will perform a cold restart which restores the program(s) and assumes a predefined status.

## Peer to peer communications

PAC8000 Process Controller can communicate with each other on a peer-to-peer basis, enabling controllers to share data with each other. This capability ensures that critical information can be efficiently shared between controllers instead of requiring data to be passed to each controller from the control room.

## I/O module configuration

The PAC8000 Process Controller receives full details of all the I/O modules under its control and stores the information in non-volatile memory. At start-up the controller downloads to the modules their configuration details, which also include the failsafe states they should adopt in the event of communication failure.

## Firmware updates

In keeping with its ability to maintain operations on a continuous basis, a redundant PAC8000 Process Controller is also capable of receiving a firmware upgrade. In a manner similar to that used for strategy updates, a controller can receive an update to its firmware while in the field. When the upgrade has been confirmed as successful, the controller can be returned to full operation as a master or as a protective standby.

## HART® pass-through

The PAC8000 Process Controller has the ability to pass smart HART® information

from field devices to a separate PC workstation, which allows you to readily interface to asset management software applications, to remotely manage the HART® information contained in your HART®-based field instruments. The PAC8000 Process Controller works with a variety of asset management packages, including Applied System Technologies' Cornerstone software or Emerson's Asset Management Solutions.

## Environmental stability

Like all of the 8000 series equipment, the PAC8000 Process Controller is designed for use in harsh environments. It operates over a temperature range of -40°C to +70°C and is resistant to shock, vibration and corrosive environments.

## Hazardous area operation

The PAC8000 Process Controller is designed also to operate in Class I, Division 2 and Zone 2 hazardous areas and can control I/O modules that have field wiring extending into the more hazardous Division 1, Zone 1 and Zone 0 areas.

## Grows as your needs grow

The system is scalable to your needs. You can add modular I/O to your system as your needs increase. Redundant controllers can be added without the need to power off your system - the backup controller powers up automatically and is seamlessly brought online.

## Maximum number of nodes

Multiple PAC8000 controller nodes can reside on the same network allowing peer-to-peer communications, as explained above. However, too many nodes can degrade performance, so GE Intelligent Platforms recommends placing no more than 25 nodes on the same subnet of a network.



## 8000 Process I/O™ hardware

### Overview

8000 is a completely modular I/O solution for both general purpose and hazardous area applications. It is based on a carrier system that supports a range of modules and offers a wide variety of I/O functions, including AC mains and intrinsic safety signals, even within the same node.

### I/O Modules

I/O modules transfer signals to and from field instruments. Input modules receive signals from transmitters and sensors and convert them into a digital form for presentation to the Controller.



Output modules receive commands from the Controller and transfer them to actuators. A wide range of modules is available, including types for low-level instrumentation, AC mains and intrinsically safe signals, I/O modules typically have 4, 8 or 16 field channels.

### Field terminals

Field terminals provide the interface between the I/O modules and the field wiring. They include fusing and loop-disconnect as options. A mechanical keying system prevents an I/O module from being connected to the wrong type of field terminal. Field terminals mount onto the module carrier, one to each I/O module. They are clamped firmly by the I/O module to form an electrical and mechanical assembly of high integrity. They may be replaced in service without removing carriers or disturbing the operation of other modules.

### Carriers

Carriers form 8000's physical and electrical backbone by providing a mounting to support and interconnect the controller, power supplies, I/O modules and field terminals, and carry the address, data and power lines of the internal Railbus. They provide termination points for the LAN and to the I/O modules. I/O module carriers

are available to support four or eight I/O modules.



### System power supplies

System power supplies are available for the node to convert local AC or DC supplies to power the node or provide field power for I/O modules. 8000's innovative Bussed Field Power scheme for distributing field power avoids complex wiring at the field terminal and minimizes the carrier wiring.



### 'HART-ability'

The use of 'smart' instruments on process plants is growing but this investment is not always fully exploited. Whether it is for a new installation, or the upgrade of an existing one, GE Intelligent Platforms has solutions that provide the connections between the HART field instruments, the control systems and the process automation maintenance software. Specifically, the 8000 Process I/O system has been designed to be transparent to HART signals, thus allowing the host control software and any HART field instruments to communicate directly with each other. In addition, 8000's HART connection system provides on-line access from a PC to the HART field devices for monitoring device performance.

HART devices may be selected for regular status monitoring and alerts can be issued if the status changes.

The benefits from this approach are:

- reduced commissioning time and cost
- reduced process downtime through status monitoring
- power loop maintenance costs by using field device diagnostics.

### 8000 in your system

Each PAC8000 node can address up to 64 I/O modules which, depending upon the number of channels per module, can pro-

vide up to 1024 I/O points at a single node! A node can consist of a mixture of analog and discrete modules and this gives maximum flexibility to the system designer. Full HART pass-through is provided - the 8000 appears "transparent", allowing the inquiring "agent" to access the HART capabilities of field instruments. GE Intelligent Platforms recommends placing no more than 25 nodes on the subnet of a network.

### Redundancy options

8000 has been designed to increase availability and minimize downtime. Redundant controllers, LAN Channels and power supplies can be specified as options to increase system availability. Possible downtime is further reduced by ensuring that the system components using active circuitry can be removed and replaced quickly and easily. Even the field terminals can be replaced without interrupting the operation of adjacent I/O modules. Carriers have no active circuitry and are unlikely to need replacement.

### Hazardous area applications

The 8000 is a truly field mountable system even in areas where flammable gases are present. It is available in versions to suit different area classification schemes:

- a) Equipment and field wiring located in general purpose areas, Class 1, Division 2 hazardous locations or Zone 2 hazardous areas.
- b) Equipment mounted in general purpose areas, Class 1, Division 2 hazardous locations or Zone 2 hazardous areas, with field wiring located in Division 1 hazardous locations or Zone 0 hazardous areas.

### Time stamping data

PAC8000 Controllers can be time synchronized to within approximately 10ms or 2ms if an external SNTP clock is used. Controllers can be configured to time stamp a change to any data field with a time stamping resolution equal to the execution cycle length (typically in the range 50ms to 250ms). Controllers can record approximately 8000 events (7800 worst case) in this way, before the data is over-written by new data. If more accurate time stamping is required, the dedicated Sequence of Events (SOE) module may be used. This can provide a channel-to-channel time stamp accuracy of 0.5ms, within the same module (based on a per-channel resolution of 0.25ms).



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## A control node

Many industry applications do not present an explosion risk from gas or dust hazards. In others, the environment may be classified as a Zone 2 or Division 2 hazardous area, where flammable material is expected to occur only in abnormal conditions. For both of these the 2/2 system provides effective distributed I/O for process control. 8000 supports a full range of I/O module types covering inputs and outputs for both analog and discrete circuits. The node can be mounted out on the plant in a suitable enclosure that is capable of providing protection against the environment. The diagram shows a node containing the basic components: one (or two) PAC8000 Logic Controllers, I/O modules on their carriers linked by carrier-extenders and an extension cable.

## 8000 with intrinsic safety field wiring

The 8000 Process I/O System is also capable of supporting I/O modules with intrinsic safety (IS) field wiring, for connection to certified or 'simple apparatus' field devices in Division 1 or Zone 0 hazardous areas. A range of I/O module types with IS field circuits for industry-standard DI, DO, AI, AO and pulse applications is supported.

## Integrated power supplies

Power for IS I/O modules is derived from integrated, modular power supply units. Each power unit is capable of supplying between eight and twenty I/O modules, depending on the I/O type and mix. Optional power supply redundancy is supported by means of an additional, redundant supply unit connected in an 'n+1' arrangement. In applications with mixed IS and non-IS field wiring, the full facilities of the 'Bussed Field Power' regime are retained for the non-IS part of the system. In nodes populated only with IS I/O modules, a separate system power supply module provides power for the Bus Interface Module and 'node services'. Redundancy of this supply is also supported.

## PAC8000

The mission of GE Intelligent Platforms is to design, manufacture and distribute modular, open hardware and software technology-based components for use in the most demanding real-time system applications. These field-proven components can be "snapped" together to create sophisticated control systems.

## ORDERING INFORMATION

### Controller

Order using the following part number:  
 PAC8000 Process Controller.....8521-PC-MT  
(This Controller includes PAC8000 Process control software)

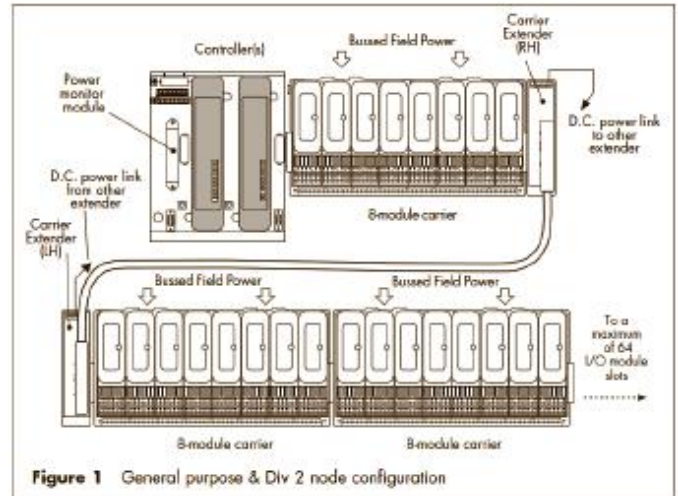
### Workbench

Workbench software is required to configure the control strategy for each controller.  
 PAC8000 Process Workbench.....8459-PC-MT  
(Will configure PAC8000 Process controllers and PAC8000 EBIM)

## CONTROLLER SPECIFICATION

See System Specification for other parameters

Modbus™ is a trademark of Schneider Automation Inc HART® is a registered trademark of the HART Communication Foundation



## LAN INTERFACE

Transmission medium.....	100BaseTX or 10BaseT Ethernet
Transmission protocol.....	Modbus over High Speed Ethernet
Transmission rates.....	10 - 100 Mbits/s
LAN connector type (x2).....	RJ45 (8-pin)
LAN Insulation (Dielectric withstand).....	1500 V
Action on software malfunction.....	Halt CPU / Reset CPU
Max. nodes on a subnet of a network.....	25

## SERIAL INTERFACES (COM 1 & COM 2)

Transmission rates.....	1.2 - 115.2 kbits/s (async.)
Transmission standard.....	RS485 half-duplex
COM 1 connector (on carrier).....	9-pin D-type connector (F)
COM 2 connector (on controller).....	9-pin D-type connector (M)

## POWER SUPPLIES

Voltage.....	10.9 - 12.6 V dc
Current.....	0.4 A (typ.)
	0.5 A (max.)

## HAZARDOUS AREA APPROVALS

Location of controller..... Zone 2, IIC T5 hazardous area .....or  
 Class 1, Div 2, Groups A, B, C, D T5 hazardous location

Applicable standards:

- Factory Mutual Research Co., Class No. 3611 for Class 1, Division 2, Groups A, B, C, D hazardous locations
- CSA Std C22.2 No. 213 for Class 1, Division 2, Groups A, B, C, D hazardous locations
- ATEX Category 3 (for Zone 2 installation) to EN50021:1999 protection type 'n'
- UL 61010-1 "Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use; Part 1: General Requirements, 2nd Edition

## MECHANICAL

Module dimensions.....	69 (w) x 232 (d) x 138 (h) mm
Weight (approx.).....	1.35 kg

## GE Intelligent Platforms Information Center

Headquarters:  
 1 800 GE 32682  
 1 800 322 2616  
 1 434 978 5100  
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## Additional Resources

For more information, please visit the GE Intelligent Platforms website at:

[www.ge-ip.com](http://www.ge-ip.com)

