



4871 Process Controller

**Independent or Parallel
Multiple Process Control**



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Parr Series 4871 Process Controllers are configured during manufacturing to the design specifications of the end user.

The Parr Model 4871 Process Controller has been developed to provide an integrated stand alone control system for controlling either a single reactor with multiple feed and product controls or multiple reactors operating independently or in parallel.

The Parr 4871 Process Controller combines a single turnkey system containing the following component parts:

Control Module:

- Honeywell HC-900 Hybrid Controller.

Flexible, Powerful Software:

- SpecView SCADA software.
- System set up with graphical user interface configured to individual requirements.

Power Controller

- Parr 4875 Power Controllers for handling heating, cooling, safety and motor control devices.

Control Module

The control module of the Parr 4871 Process Controller is a Honeywell HC900 Hybrid Controller. This controller combines analog and logic control into a versatile, cost-effective controller designed specifically for process applications requiring analog measurement combined with programmable control actions.

Input / Output

The controller is adapted to each users requirements by adding to the control chassis input and output modules. Each module provides for between four and sixteen individual inputs or outputs fully isolated from one another. These modules include:

Input Modules

The analog inputs are of universal type and are most commonly used for thermocouple or RTD temperature sensors, strain gage type pressure transducers, and similar devices with mV, V, or resistance inputs. Input isolation, cold junction compensation, and burnout protection are incorporated into the circuitry. Each analog input module provides for eight separate inputs.

The digital inputs can be logic inputs or contact closures. These are typically used for sensing valve positions or conditions of safety devices. Each digital input module provides for sixteen separate inputs.

Output Modules

The analog outputs are 4-20 mA. A suitable dropping resistor can be used to convert this to 0-5 or 0-10 VDC. Analog outputs are commonly used to set stirrer motor operating speeds, position control valves, or drive mass flow controllers or pumps. Each analog output is capable of controlling four separate devices or functions.

The digital outputs are open collector type capable of sinking up to 300 mA. They are commonly used to control heaters, solenoid valves for cooling or other flow control, system safety shut down, visual and/or audible alarms, and similar devices. Each digital output module is capable of controlling sixteen separate devices or functions.

Control Loops

The controller can provide any number of PID or ON/OFF control loops, limited solely by the available CPU memory.

The PID control algorithm includes auto-tuning and fuzzy logic overshoot suppression for each control loop. For heating and cooling control, the PID control loops provide time proportioning of the associated digital output.

Many temperature control applications utilize two separate time proportioning outlets with one PID controller; one for heating and one for cooling.

Control loops can be linked together to provide cascade, feed forward or ratio control for difficult or advanced control applications.

Both high and low limit values can be entered for each control loop to sound alarms or initiate safety control schemes.

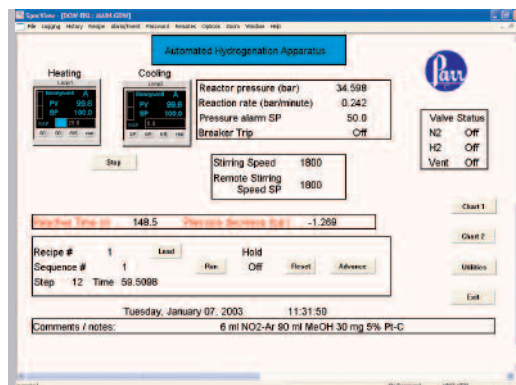
Set Point Programming

Recipes for controlling the entire process of a reactor can be written using the setpoint profiler incorporated into the control firmware. A single profile may be from 2 to 50 segments in length. A typical profile might be a ramp and soak of the reactor temperature but, in addition, the analog and digital outputs can be tied to the basic profile to start and stop flows, activate stirrers or accessories, or change alarms. Any of the setpoints within the profile can be protected with the setpoint guarantee function that assures that the process variable will be within the entered limits before the profile can proceed.

The number of set point programmers is limited by the amount of available memory in the controller CPU. Typically, at least eight separate profiles can be running independently (8 reactors each on their own program, for example) simultaneously.

While a maximum of 70 profiles can be stored in the controller itself, an unlimited number can be stored in the operator's PC for rapid transfer to the controller.

In addition to the setpoint profiling capability, the controller is also equipped with a setpoint scheduling function. This feature can operate up to 8 profiles operating on a common time base.



Screenshot of typical 4871 Controller user interface main screen.

The 4871 Controller includes Operational Sequence Control

The sequence control function offered by the 4871 Controller greatly expands the capabilities of this control for users who wish to control reactor systems. The operation of valves, pumps and other peripheral devices can be programmed on either a time or an event driven basis. Sequences can be very simple timed events or they can be very complex with multiple nested default sequences programmed to occur only if process feedback indicates a need to take alternative actions.

Communications Channels

Each 4871 controller is equipped with a RS-232 and Ethernet communication port. The RS-232 port is used to establish fundamental control logic. The Ethernet port provides communication with the host PC when using the SpecView GUI program. Multiple controllers, each with a unique address, can be networked on the Ethernet interface with a single connection to the PC.

The principal advantage of the Ethernet interface is that it allows the user to use an existing network infrastructure to connect the controller to the PC. As a result, one can operate the controller over the network from anywhere within your facility. Additionally, Internet access from remote locations becomes possible. This type of connectivity offers unique possibilities, for example, related to remote diagnostics and system troubleshooting.

Three Models Available

Parr 4871 Process Controllers are available in three different models to cover a wide range of applications. The 4871A will accept four I/O modules (typically up to 36 inputs and outputs). The 4871B will accept up to eight I/O modules, and the 4871C will accept up to 12 I/O modules. If more than 100 inputs and outputs are required, multiple controllers can be linked.

Flexible, Powerful Software

In most laboratory and pilot plant applications, a PC will be used for the operator interface. For plant or production applications, an industrial type user interface box with a color graphic LCD is available.

SpecView SCADA Software

SpecView describes their product as “Software for people with other jobs”. That seems to be an excellent description of this software package used with the 4871 controller to:

- Configure the control package
- Develop the graphical screen layout
- Establish the data logging profiles
- Prepare custom reports
- Create bar graphs
- Generate time trend graphs
- Monitor alarms
- Create flexible recipes
- Retrieve and replace logged data
- Operate the reactor system(s)

The full software package, not just a run-time version, is supplied with 4871 controller so operators can enhance their system as they get familiar with it or expand / change their applications. Download a demo at www.specview.com.

Graphical User Interface

An integral part of the Honeywell Controller is the control builder software. This is the “Drag and Drop” software that enables Parr to rapidly establish the controller’s internal logic and adapt it to individual systems requirements.

The user can employ this same software to change or enhance the fundamental logic of the controller as additional components are added to the system or as functions need to change.

Current Industrial Standards

Modbus, Ethernet, auto-tuning, fuzzy logic, auto-configuring Man Machine Interface (MMI), supervisory control and data acquisition (SCADA), multi-loop control; these are a few of the terms and capabilities designed into the hardware and software incorporated into the Parr 4871 controller.

This is a very modern and powerful package that enables us to offer turnkey systems ready to run within weeks of order at very attractive prices compared with custom programmed systems previously available.



The photo above illustrates a six station multi-reactor system. Each reactor is equipped with its own constant pressure gas delivery system. The 4871 Controller maintains all of the important system parameters, including temperature and stirring speed, and records the gas consumption of each of the reactors.

PC Requirements

The PC used with the 4871 serves several functions. It is the operator’s user interface for controlling the process. It also logs all of the operating data generated during a process run. It can also store multiple setups for rapid transfer to the 4871 Process CPU.

Any modern PC with current Windows operating system can be used with these controllers.

It is important to note that the control of the process always resides within the 4871 Controller, and not in the PC itself.



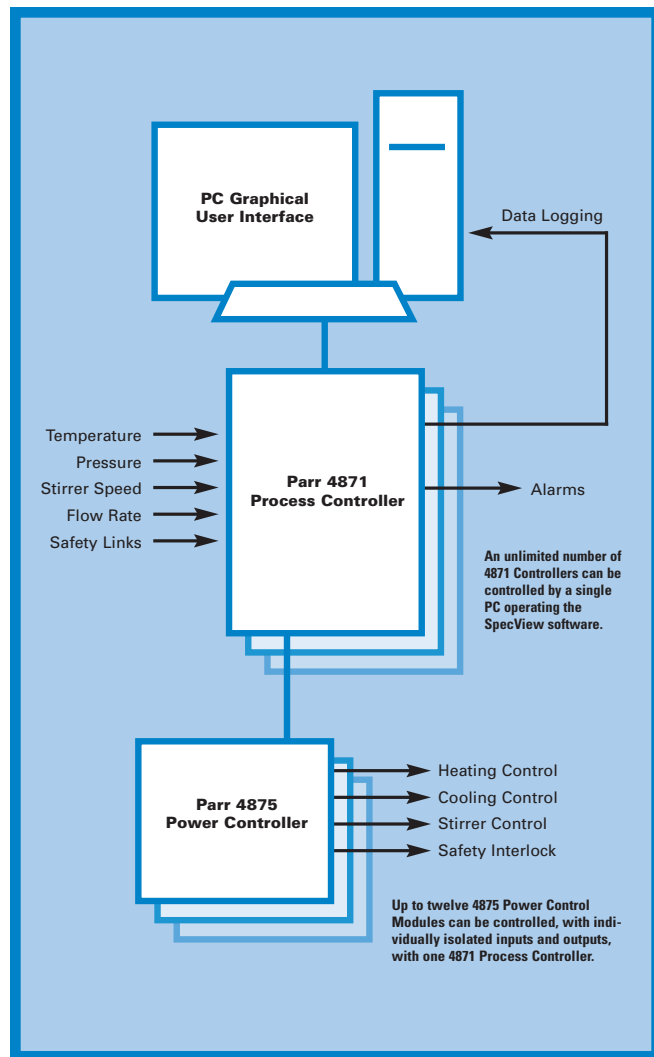
The Parr 4875 Power Controller module is flexible and can be used in remote locations from the system being controlled.

Power Controller

Parr designs, builds and furnishes power controllers to adapt the analog and digital outputs from the 4871 controllers to the reactors or systems being controlled. These power controllers handle all of the high current power circuits so that the control circuitry is isolated from these loads. This also makes it possible to install the controller in a control room some distance from the system being controlled.

The power controller or controllers will be designed for each individual system, but as an example, a 4875 power controller includes:

1. A solid-state relay sized to handle the current drawn by the vessel heater. This is commonly a 25-amp relay with its protective fuses.
2. A solid-state relay sized to drive a solenoid valve to control the flow of cooling water to the vessel.
3. A motor speed controller that converts the analog output signal from the controller to the electrical signal required to drive the specific stirrer motor. A circuit breaker for the motor is also provided.
4. A lockout relay to shut down the heater circuit should an alarm condition be detected.
5. Status lights for the principal functions.
6. Connections of appropriate style for the power input and device outputs.



NOTE: One model 4875 Power Controller is required for each reactor in a parallel system.



This custom order is set up to run sixteen Reactors, two 4871 Process Controllers, with sixteen 4875 Power Controllers all through one PC.

4871 Process Controller Selection Guide

Each 4871 Controller will be specified and assembled to match the users intended application. These applications can vary from a single reactor with full process control to eight reactors operating in parallel. The 4871 Process Controller connects to a customer-supplied PC with a current Windows Operating System.

There are three basic parts to this configuration process.

1. Basic Controller

The base model includes all of the components that will be required for any system:

- Control chassis with CPU
- Communication module to PC
- Power supply
- Connection cable to PC
- Operating and configuration software
- Ethernet connection
- Specview Scada Software

Available Models:

4871A Process Controller for up to 4 I/O Modules

4871B Process Controller for up to 8 I/O Modules

4871C Process Controller for up to 12 I/O Modules

2. Input and Output Modules

These are the analog and digital inputs and outputs required to receive the signals from the sensors (thermocouples, pressure transducers, position switches, safety interlocks, etc.) installed on the system and to drive the control devices (motors, heaters, control valves, coolant flow, etc) which operate the system.

- Analog Input (AI) 8 / module
- Digital Input (DI) 16 / module
- Analog Output (AO) 4 / module
- Digital Output (DO) 16 / module

3. Power Controller

The load carrying components are mounted separately from the data processing components mounted in the controller cabinet. Typically the components mounted in a power controller would include:

- A Solid state load relay for heater control
- A Solid state load relay for cooling control
- Motor speed controller
- Fuses and circuit breakers for above

A Model 4875 Power Controller includes a complement of heating, cooling and motor control to operate a single reactor. Each reactor being controlled by the Model 4871 Controller will require its own power controller. Power controllers can be custom designed to meet unique requirements with additional control features or more limited systems.

Please contact the customer service department for assistance in configuring the Series 4871 Process Controllers.



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