

Series Number:

4871

4871 Process Controller

The **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 4871 is the ideal choice for all of Parr Instrument Company's custom systems, including: tubular reactors, multiple reactor systems (both batch and cascade systems), continuous flow stirred reactors, and fluidized bed reactors.

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.

Function	
Analog Input (AI) Maximum Channels	480
Analog Output (AO) Maximum Channels	200
Digital I/O Maximum Channels	1920
Remote I/O	Yes
Control Loops	Per Memory
Logic Scan	25-50 ms
Loop Scan	500 ms
Ethernet Communications	Yes
Peer to Peer Communications	Yes
Modbus Master	Yes
Modbus Slave	Yes
On-line Programming	Yes
Function Blocks	2000
Sequential Functions	Yes
E-mail Alarms	Yes

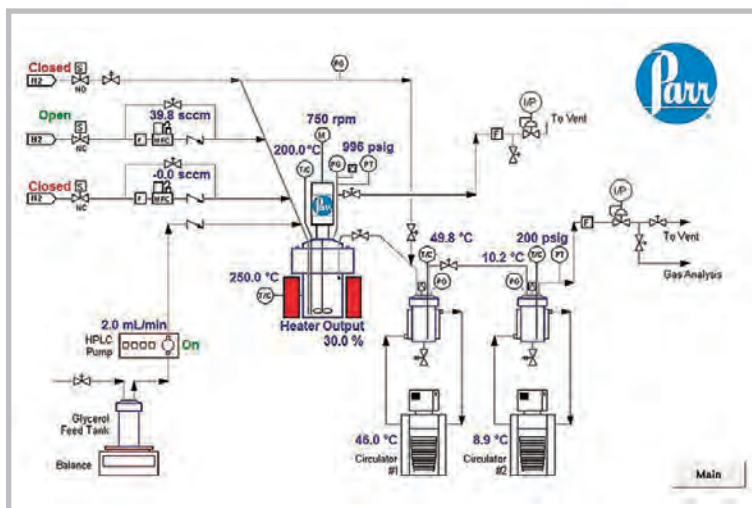
Input / Output

The controller is adapted to each user's 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.



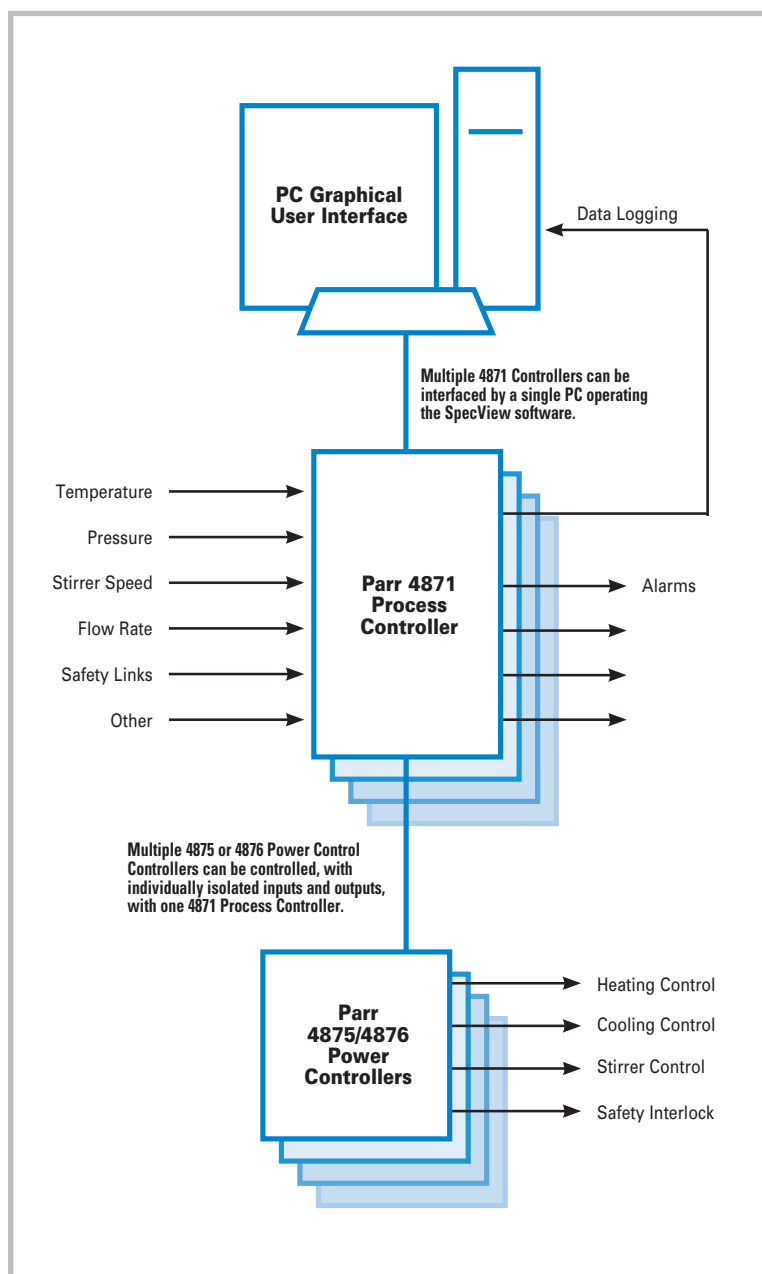
Process Flow Diagram for stirred reactor system.

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.

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4871 Process Controller Input/Output Diagram.

Output Modules

The analog outputs are 0-20 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 module 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 outputs 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.

The 4871 Process Controller combines the following components into a single control system:

Control Module:

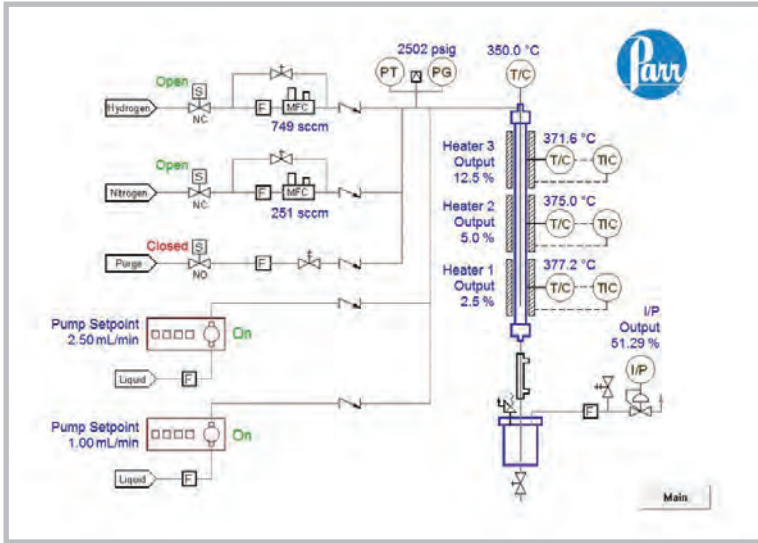
- Honeywell HC900 Hybrid Controller

Flexible, Powerful Software:

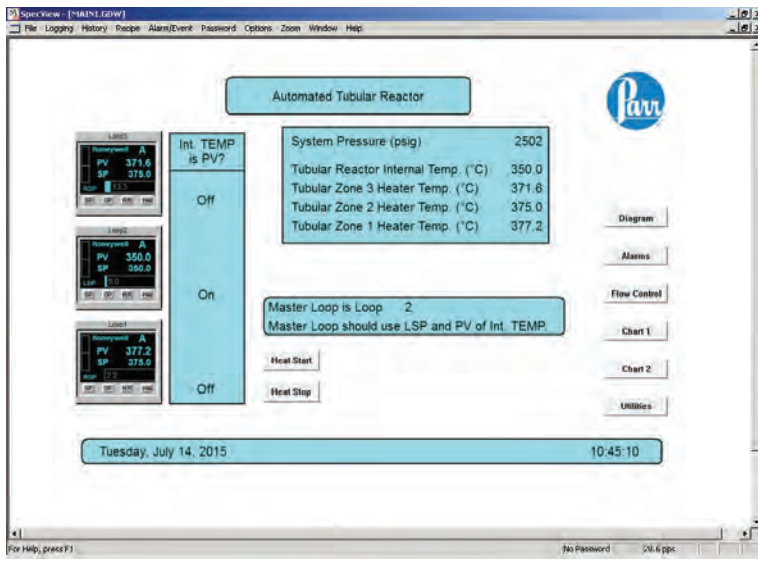
- SpecView SCADA software
- System set up with graphical user interface configured to individual requirements

Power Controller:

- 4875 or 4876 Power Controllers for handling heating, cooling, safety, and motor control devices



Process Flow Diagram for a tubular reactor with real-time process renderings.



Screenshot of a 4871 Controller user interface for automated control of a tubular reactor system.

4871 Dimensions

Model	Width, in.	Height, in.	Depth, in.
4871A	12.86	15.12	11.00
4871B	16.98	21.56	13.00
4871C	29.78	21.56	13.00

Set Point Programming

Ramp/Soak profiles for controlling the entire process of a reactor can be written using the set point 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 set points within the profile can be protected with the set point guarantee function that assures that the process variable will be within the entered limits before the profile can proceed.

The number of set point profiles is limited by the amount of available memory in the controller CPU. Typically, at least eight separate profiles can be running simultaneously. For example, eight reactors can be running a unique program at the same time.

While a maximum of 99 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 set point profiling capability, the controller is also equipped with a set point scheduling function. This feature can operate up to 8 profiles operating on a common time base.

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 an RS-485 and Ethernet communication ports. The RS-485 port is used for initial configuration and communications setup. 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.

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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 twelve I/O modules. If more than 100 inputs and outputs are required, multiple controllers can be linked.

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:

- Interface with 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 the 4871 Controller so operators can enhance their system as their needs change or expand/change their applications. Download a demo at www.specview.com.

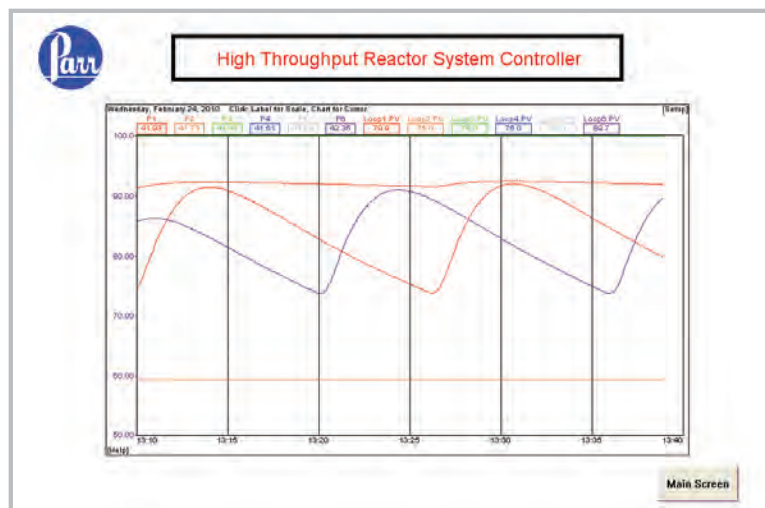
Graphical User Interface

An integral part of the Honeywell Controller is the hybrid control designer 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.



Screenshot from remote PC showing logged data in Data Logging Mode.

This modern and powerful package enables Parr to configure and build turnkey systems within weeks of order at very attractive prices.

PC Requirements

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

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.

4871 Ordering Guide

Each 4871 Controller will be specified and assembled to match the user's 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.

Please contact a Parr Customer Service Representative to discuss configuring a 4871 Process Controller to your specific application.

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