

# SNAP PAC Brains

## Features

- Multi-protocol communications and I/O processor
- Handles analog, digital, serial, and special-purpose modules all on one mounting rack
- Distributed intelligence for your SNAP PAC system
- Two switched Ethernet network interfaces for multi-drop connections

## Description

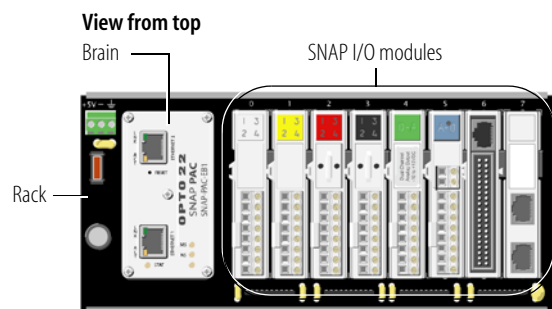
SNAP PAC brains are powerful and versatile I/O and network communications processors for your SNAP PAC System™. Designed primarily to work in distributed systems controlled by a SNAP PAC S-series or R-series controller, SNAP PAC brains provide local intelligence that frees the controller for supervisory tasks.

For example, each brain independently handles functions such as latching, counting, thermocouple linearization, watchdog timers, and PID loop control. These functions continue to work on the brain even if communication with the controller is lost.

## EB Series Brains

Two SNAP PAC brains are available: the **SNAP-PAC-EB1** and the **SNAP-PAC-EB2**. They are identical in their functions and features except that the SNAP-PAC-EB1 provides high-speed digital functions for use with 4-channel digital I/O and analog ramping. The SNAP-PAC-EB2 does not offer high-speed digital functions or analog ramping. For a complete list of brain features, see [page 3](#).

Each SNAP PAC brain is equipped with two switched Ethernet network interfaces. Because these interfaces share a single IP address and act just like an Ethernet switch, SNAP PAC brains can be installed not only in a standard star configuration, but also in a multi-drop configuration, extending the control network without the expense of additional Ethernet network hardware.



**SNAP-PAC-EB1 Brain**

## I/O Processing

Each SNAP PAC brain mounts on a SNAP PAC rack with up to 4, 8, 12, or 16 SNAP I/O™ modules.

SNAP PAC brains support all SNAP I/O analog, digital, serial, and special-purpose input and output modules we sell. These modules can all be mixed on the same mounting rack and placed in any position on the rack, to accommodate the required mix of signals at any location. Each SNAP I/O module provides from 1 to 32 I/O points, depending on the module. For more information on mounting racks, see Opto 22 form #1684, the *SNAP PAC Racks Data Sheet*. For more information on I/O modules, visit our website at [www.opto22.com](http://www.opto22.com).

## Multiple Protocol Support

In addition to I/O processing, SNAP PAC brains support communication using multiple protocols running simultaneously over Ethernet. The brain supports Modbus®/TCP, SNMP for network management, FTP for the brain's built-in file system, SMTP (email client), and Opto 22's own memory-mapped OptoMMP protocol. Communication with OPC 2.0-compliant clients is available through OptoOPCServer (see "Software," below).

## Part Numbers

Part	Description
SNAP-PAC-EB1	Ethernet-based analog, digital, and serial I/O and communications processor for the SNAP PAC System, with two switched Ethernet network interfaces and high-speed digital functions
SNAP-PAC-EB2	Ethernet-based analog, digital, and serial I/O and communications processor for the SNAP PAC System, with two switched Ethernet network interfaces

# SNAP PAC Brains

## Software

SNAP PAC brains are primarily designed for use with a **SNAP PAC programmable automation controller**. The controller runs a control program built with PAC Project™ software. The PAC Project software suite comes in two forms, Basic and Professional.

**PAC Project Basic**, which is included in the purchase of a SNAP PAC controller, consists of control programming, human-machine interface (HMI) creation, and configuration software. **PAC Project Professional** is available for purchase and adds OptoOPCServer™

for OPC connectivity, OptoDataLink™ for database communications, and additional features.

In addition to using a SNAP PAC controller with PAC Project software, you can communicate with the brain using Modbus/TCP or OptoMMP. For Modbus, see Opto 22 form #1678, the *Modbus/TCP Protocol Guide*. For OptoMMP, a free developer toolkit is available on our website, [www.opto22.com](http://www.opto22.com). The OptoMMP Communication Toolkit includes ActiveX components and C++ classes, so you can use programming tools such as Visual Basic or Visual C++ to communicate with the brain. See form #1465, the *OptoMMP Protocol Guide*, for more information.

## Specifications

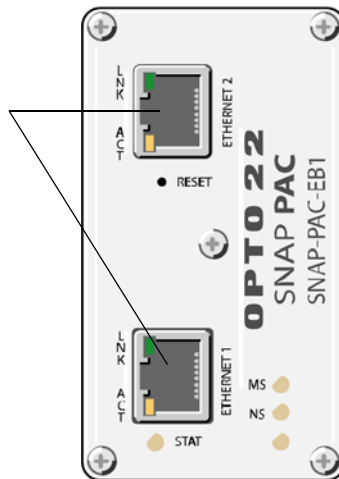
Power Requirements	5.0–5.2 VDC at 750 mA maximum (does not include module power requirements)
Memory	16 MB RAM
Backup battery	CR2032 Lithium, user replaceable. 10-year minimum life for real-time clock backup.
Network Interfaces	IEEE 802.3 network, 10Base-T and 100Base-TX. Automatic MDC/MDI-X crossover (Ethernet crossover cable not required for direct connection to PC). Two switched ports, allowing multi-drop (daisy-chain) or standard star network configuration.
Maximum Ethernet Segment Length	100 meters with Category 5 or superior UTP. For 100 Mbps at this distance, use Category 5 or superior solid UTP.
Operating Temperature	0 to 60 °C
Storage Temperature	-40 to 85 °C
Humidity	0–95% humidity, non-condensing

## LEDs and Network Interfaces

### Switched Ethernet network interfaces

Brains can be networked in a multi-drop (daisy-chain) configuration or in a standard star configuration using either Ethernet interface. Both interfaces use the same IP address.

NOTE: When using a multi-drop configuration, be aware that if power to a brain is lost, all brains beyond it on the network will also lose communication.



### LEDs

LED	Indicates
LNK	Link established with Ethernet network
ACT	Activity on Ethernet network
STAT	Brain status
MS NS Unnamed	Reserved for future use

# SNAP PAC Brains

## Features

The following table compares SNAP PAC brains with firmware 8.0.

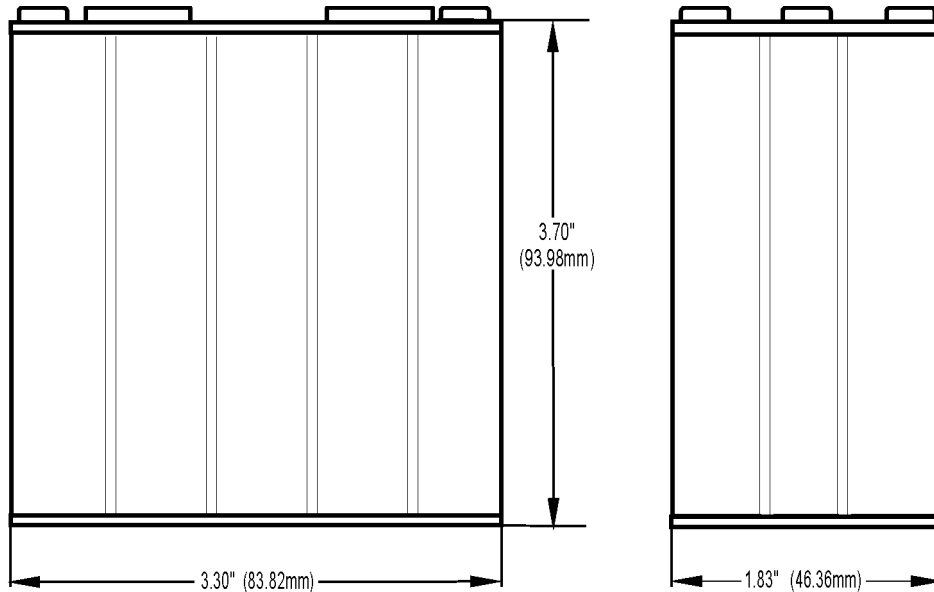
FEATURE		SNAP-PAC-EB1	SNAP-PAC-EB2
I/O modules supported	Digital (4–32 channels)	●	●
	Analog (2–32 channels)	●	●
	Serial (RS-232, RS-485)	●	●
	Special-purpose (motion control, power monitoring, Profibus®, Wiegand®)	●	●
Digital I/O point features	On/off status	●	●
	Input latching	●	●
	Watchdog timer <sup>1</sup>	●	●
	High-speed counting (up to 20 kHz) <sup>1</sup>	●	
	Quadrature counting <sup>2</sup>	●	
	On-pulse and off-pulse measurement <sup>1,3</sup>	●	
	TPO (time-proportional output) <sup>3</sup>	●	
Analog I/O point features	Pulse generation (N pulses, continuous square wave, on-pulse, and off-pulse) <sup>3</sup>	●	
	Thermocouple linearization (32-bit floating point for linearized values)	●	●
	Minimum/maximum values	●	●
	Offset and gain	●	●
	Scaling	●	●
	Time-proportional output <sup>4</sup>	●	●
	Output clamping	●	●
	Filter weight	●	●
	Watchdog timer	●	●
Ramping <sup>3</sup>	●		
Ethernet networking		●	●
Two switched Ethernet network interfaces (one IP address)		●	●
Maximum number of modules allowed per I/O unit (with largest rack): Any mix of 16 digital, 16 analog, 8 serial or special-purpose		●	●
PID logic on the brain (96 PID loops per brain)		●	●
Modbus®/TCP		●	●
OPC driver support		●	●
OptoMMP memory-mapped protocol		●	●
SNMP (network management) <sup>5</sup>		●	●
FTP server, file system		●	●
Email (SMTP client)		●	●
Scratch Pad area for peer-to-peer data (bits, floats, integers, and strings)		●	●
Digital events <sup>1</sup> , Alarm events, Serial events, and Timed events <sup>1</sup>		●	●
Event messaging		●	●

FEATURE	SNAP-PAC-EB1	SNAP-PAC-EB2
UDP Streaming	●	●
Data logging in the brain	●	●
Security (IP filtering, port access)	●	●
Realtime clock (RTC)	●	●
I/O point data mirroring and memory map copying	●	●

- 1 Four-channel digital modules only; not available on high-density digital modules.
- 2 Requires a SNAP quadrature input module (SNAP-IDC5Q).
- 3 Available when used with PAC Control Professional and a SNAP PAC controller.
- 4 Requires a SNAP analog TPO module (SNAP-AOD-29).
- 5 Currently not available on analog modules with more than 4 points.

## Dimensional Drawing

### Dimensions—SNAP PAC Brains



# SNAP PAC Brains

## System Architecture

SNAP PAC brains are ideally suited for use as local I/O, logic, and communication processors in distributed systems.

The system shown below is controlled by a SNAP PAC S-series standalone controller running a PAC Control strategy.

While the controller provides overall direction to the control system, each SNAP PAC brain locally handles counting, latching, thermocouple linearization, PID loop control, and other functions for the I/O modules on the racks. These local functions continue even if the controller loses communication with the brains.

PC used to develop a PAC Control strategy.  
Once developed, the strategy runs independently on the SNAP PAC controller.

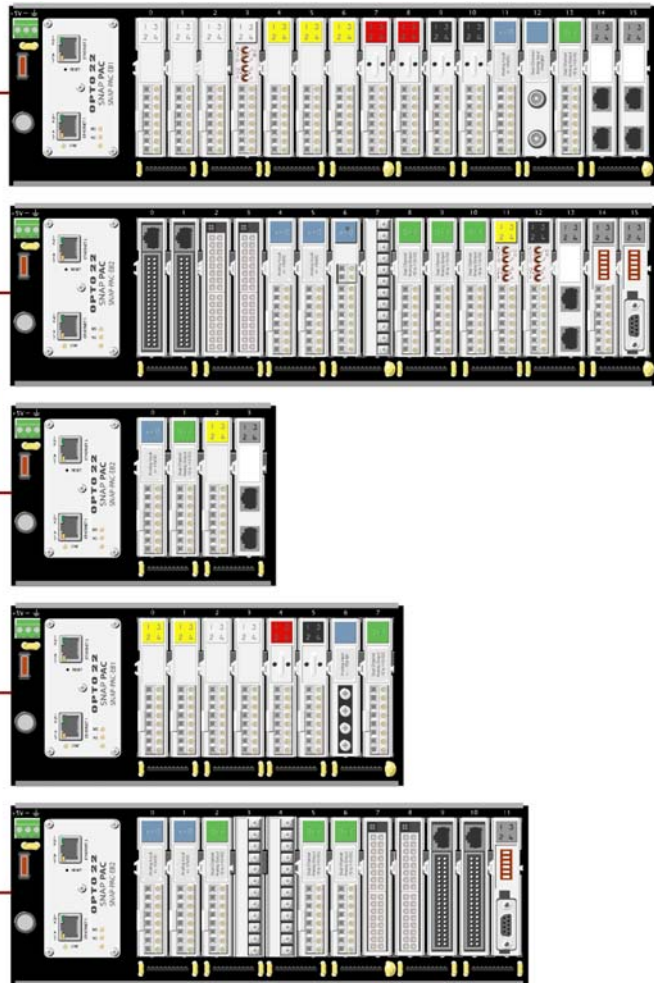
One or more PCs running a PAC Display HMI for operators or technicians.



SNAP PAC S-series controller running a PAC Control strategy



SNAP PAC brains and I/O (distributed units)



**System Architecture (continued)**

SNAP PAC brains offer two options for networking. They can be networked in a standard star configuration using off-the-shelf Ethernet network switches or routers, as shown in the diagram on the previous page.

SNAP PAC brains can also be networked in a daisy-chain configuration, using the two switched Ethernet interfaces on each brain, as illustrated below.

In this diagram, a rack-mounted SNAP PAC R-series controller runs the PAC Control strategy and controls the system. The distributed brains are daisy-chained together, eliminating the expense of additional routers or switches.

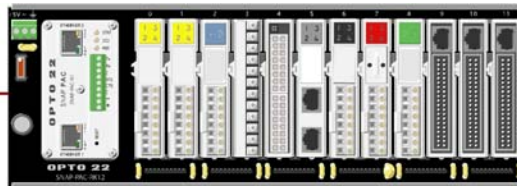
PC used to develop a PAC Control strategy.  
Once developed, the strategy runs independently on the SNAP PAC controller.



One or more PCs running a PAC Display HMI for operators or technicians.



SNAP PAC R-series controller running a PAC Control strategy



SNAP PAC brains and I/O (distributed units), daisy chained

