

# SNAP PAC Brains

## Features

- Multi-protocol communications and I/O processor
- Handles analog, digital, and other SNAP I/O™ modules all on one mounting rack
- Distributed intelligence for your SNAP PAC system
- Choose Ethernet or serial network connections, both with multidrop capability
- Factory Mutual-approved Ethernet versions available

## Description

SNAP PAC brains are powerful and versatile I/O and network communications processors for your SNAP PAC System™. These brains are designed primarily to work in distributed systems controlled by a SNAP PAC programmable automation controller, but SNAP PAC Ethernet brains can also be used as intelligent remote I/O in an Allen-Bradley® Logix-based PLC system.

All 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.

SNAP PAC brains can also be used independently for standalone I/O processing and communication.

SNAP PAC brains use either Ethernet or serial networks.

- SNAP PAC **EB** brains communicate over a standard 10/100 Mbps Ethernet network.
- SNAP PAC **SB** brains communicate over an RS-485 serial network, 2-wire or 4-wire, using a binary protocol.

## EB Series Brains

SNAP PAC Ethernet Brains include the **SNAP-PAC-EB1** and the **SNAP-PAC-EB2**, both with Factory Mutual versions available (indicated by **-FM** at the end of the part number). These brains 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. The SNAP-PAC-EB2 does not offer high-speed digital functions. For a complete list of brain features, see [page 4](#).

Each SNAP PAC EB 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 optionally in



**SNAP-PAC-EB1 Brain**

a multi-drop configuration, extending the control network without the expense of additional Ethernet network hardware.

## SB Series Brains

The two SNAP PAC Serial Brains are the **SNAP-PAC-SB1** and the **SNAP-PAC-SB2**. Like the EB brains, the two SB brains are identical except that the SNAP-PAC-SB1 provides high-speed digital functions for use with 4-channel digital I/O. The SNAP-PAC-SB2 does not offer high-speed digital functions. See [page 4](#) for a comparison of brain features.

## Part Numbers

Part	Description
SNAP-PAC-EB1	Ethernet-based analog, digital, and serial I/O and communications processor, with two switched Ethernet network interfaces and high-speed digital functions
SNAP-PAC-EB1-FM	Ethernet-based analog, digital, and serial I/O and communications processor, with two switched Ethernet network interfaces and high-speed digital functions, Factory Mutual approved
SNAP-PAC-EB2	Ethernet-based analog, digital, and serial I/O and communications processor, with two switched Ethernet network interfaces
SNAP-PAC-EB2-FM	Ethernet-based analog, digital, and serial I/O and communications processor, with two switched Ethernet network interfaces, Factory Mutual approved
SNAP-PAC-SB1	Serial-based analog and digital I/O and communications processor, with high-speed digital functions
SNAP-PAC-SB2	Serial-based analog and digital I/O and communications processor

# SNAP PAC Brains

## I/O Processing

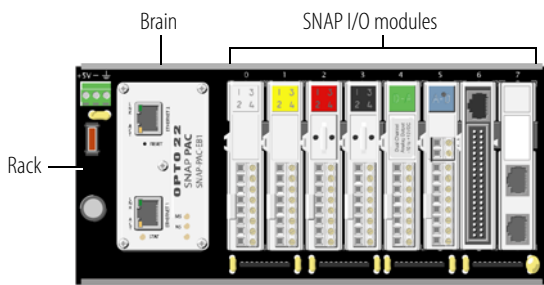
Each SNAP PAC brain mounts on a SNAP PAC rack with up to 4, 8, 12, or 16 SNAP I/O modules.

SNAP PAC EB brains support all SNAP analog, digital, serial, and special-purpose input and output modules. SNAP PAC SB brains support all SNAP analog and digital modules.

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 SNAP I/O modules, visit our website at [www.opto22.com](http://www.opto22.com).

### View from top



## Multiple Protocol Support on Ethernet

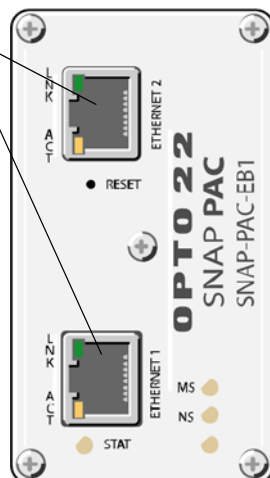
In addition to I/O processing, SNAP PAC Ethernet brains support communication using multiple protocols running simultaneously over Ethernet. These brains support EtherNet/IP™, Modbus®/TCP, SNMP for network management, FTP for the brain's built-in file system, SMTP (email client), and Opto 22's open memory-mapped

## LEDs and Network Interfaces—Ethernet Brains

### Switched Ethernet network interfaces

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

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



OptoMMP protocol. Communication with OPC 2.0-compliant clients is available through OptoOPCServer (see "Software," below).

## 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 SNAP PAC brains using the open and documented OptoMMP protocol. A free OptoMMP Communication Toolkit is available on our website, [www.opto22.com](http://www.opto22.com). This toolkit includes ActiveX components and C++ classes, so you can use programming tools such as Visual Basic or Visual C++ to communicate with the brains. See form #1465, the *OptoMMP Protocol Guide*, for more information.

Ethernet brains can also communicate with **Allen-Bradley RSLogix® systems** using EtherNet/IP (see Opto 22 form #1770, the *EtherNet/IP for SNAP PAC Protocol Guide*, on our website).

In addition, Ethernet brains communicate using **Modbus/TCP**; see Opto 22 form #1678, the *Modbus/TCP Protocol Guide*, for more information.

## LEDs

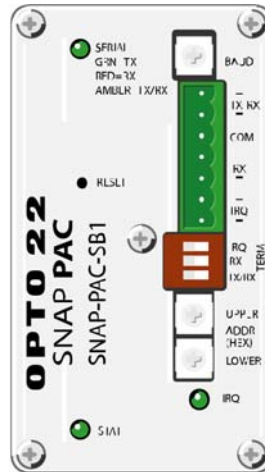
LED	Indicates
LNK	Link established with Ethernet network
ACT	Activity on Ethernet network
STAT	Brain status
MS	EtherNet/IP Module Status
NS	EtherNet/IP Node Status
Unnamed	Reserved for future use

# SNAP PAC Brains

## LEDs and Network Interfaces—Serial Brains

### LEDs

LED	Indicates
SERIAL	Green = Transmit Red = Receive Amber = Transmit/Receive
STAT	Brain status
IRQ	Reserved for future use



### Serial port

On a serial brain, the port is RS-485, either 2-wire or 4-wire. Baud rate, termination, and address are set using the switches on the brain's top cover.

See form #1690, the *SNAP PAC Brains User's Guide*, for serial cable recommendations and wiring.

*NOTE: IRQ connections and LED are reserved for future use.*

## Specifications

Power Requirements	5.0–5.2 VDC at 750 mA maximum (does not include module power requirements)
Memory	16 MB RAM
Backup battery for real-time clock	Rechargeable (recharges whenever the brain has power). 5-year life when power is off. (Models manufactured before August 2007 have user-replaceable batteries. See original user guide for details or contact Product Support.)
Operating Temperature	0 to 60 °C
Storage Temperature	-40 to 85 °C
Humidity	0–95% humidity, non-condensing
<b>Ethernet Brains (EB)</b>	
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 interfaces, 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.
<b>Serial Brains (SB)</b>	
Network interfaces	RS-485, 2- or 4-wire, twisted pair(s), with shield
Serial data rates	300 baud to 230.4 Kbaud
Range: Serial multidrop	32 stations maximum between repeaters; up to 3000 ft (914 m) between repeaters

## Features

The following table compares SNAP PAC brains using firmware 8.3.

FEATURE		SNAP-PAC-EB1	SNAP-PAC-EB1-FM	SNAP-PAC-EB2	SNAP-PAC-EB2-FM	SNAP-PAC-SB1	SNAP-PAC-SB2
Factory Mutual approval (U.S. and Canada)			●		●		
Ethernet networking		●	●	●	●		
Two switched Ethernet network interfaces (one IP address)		●	●	●	●		
Ethernet network security (IP filtering, port access)		●	●	●	●		
Serial networking (RS-485, 2-wire or 4-wire)						●	●
I/O modules supported	Digital (4–32 channels per module)	●	●	●	●	●	●
	Analog (2–32 channels per module)	●	●	●	●	●	●
	Serial (RS-232, RS-485)	●	●	●	●		
	Special-purpose: power monitoring	●	●	●	●	●	●
	Special-purpose: motion control, Profibus®, Wiegand®	●	●	●	●		
Digital I/O point features	On/off status	●	●	●	●	●	●
	Input latching	●	●	●	●	●	●
	Watchdog timer	●	●	●	●	●	●
	High-speed counting (up to 20 kHz) <sup>2</sup>	●	●			●	
	Quadrature counting <sup>3</sup>	●	●			●	
	On-pulse and off-pulse measurement <sup>2,4</sup>	●	●			●	
	Frequency and Period measurement <sup>4</sup>	●	●			●	
	TPO (time-proportional output) <sup>4</sup>	●	●	●	●	●	●
	Digital totalizing <sup>4</sup>	●	●	●	●	●	●
Pulse generation (N pulses, continuous square wave, on-pulse, and off-pulse) <sup>4</sup>	●	●	●	●	●	●	
Analog I/O point features	Thermocouple linearization (32-bit floating point for linearized values)	●	●	●	●	●	●
	Minimum/maximum values	●	●	●	●	●	●
	Offset and gain	●	●	●	●	●	●
	Scaling	●	●	●	●	●	●
	Time-proportional output <sup>5</sup>	●	●	●	●	●	●
	Output clamping	●	●	●	●	●	●
	Filter weight	●	●	●	●	●	●
	Watchdog timer	●	●	●	●	●	●
	Analog totalizing <sup>4</sup>	●	●	●	●	●	●
Ramping <sup>4</sup>	●	●	●	●	●	●	

# SNAP PAC Brains

FEATURE	SNAP-PAC-EB1	SNAP-PAC-EB1-FM	SNAP-PAC-EB2	SNAP-PAC-EB2-FM	SNAP-PAC-SB1	SNAP-PAC-SB2
Maximum number of modules allowed per I/O unit (with largest rack): Any mix of 16 digital, 16 analog, 8 serial or special-purpose	●	●	●	●	● 1	● 1
PID logic on the brain (96 PID loops per brain)	●	●	●	●	●	●
Scratch Pad area for peer-to-peer data (bits, floats, integers, and strings)	●	●	●	●	●	●
Realtime clock (RTC)	●	●	●	●	●	●
OPC driver support	●	●	●	●	● 7	● 7
OptoMMP memory-mapped protocol	●	●	●	●	●	●
EtherNet/IP™ (Allen-Bradley® Logix systems and others)	●	●	●	●		
Modbus®/TCP	●	●	●	●		
SNMP (network management) <sup>6</sup>	●	●	●	●		
FTP server, file system	●	●	●	●		
Email (SMTP client)	●	●	●	●		
UDP Streaming	●	●	●	●		
Digital events, Alarm events, Serial events	●	●	●	●	● 8	● 8
Event messaging	●	●	●	●		
Data logging in the brain	●	●	●	●		
I/O point data mirroring and memory map copying	●	●	●	●		

1 Does not support serial, motion control, Profibus, or Wiegand modules.

2 Four-channel digital modules only; not available on high-density digital modules.

3 Requires a SNAP quadrature input module (SNAP-IDC5Q).

4 Available when used with PAC Control Professional 8.2 or higher and a SNAP PAC controller. Requires firmware 8.2 or higher.

5 Requires a SNAP analog TPO module (SNAP-AOD-29).

6 Currently available on all types of modules except analog modules with more than 4 points.

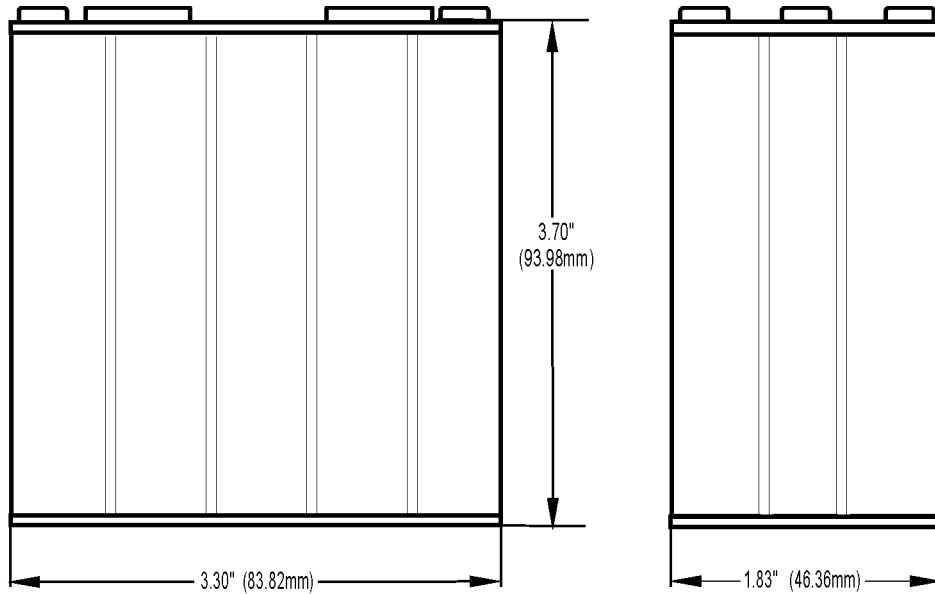
7 Available when used with OptoOPCServer and PAC Control, through a SNAP PAC S-series controller.

8 Does not support serial events.

# SNAP PAC Brains

## Dimensional Drawing

### Dimensions—SNAP PAC Ethernet Brains



### Dimensions—SNAP PAC Serial Brains

