OPTO 22

SNAP ETHERNET BRAINS

Features

> Direct 10/100 Megabit Fast Ethernet connection
> ITCP/IP and UDP/IP transport
> Multiple, simultaneous communication and protocol options

DESCRIPTION

High-performance, flexible SNAP Ethernet brains are part of Opto 22's SNAP Ethernet systems, which let you connect to state-of-the-art Opto 22 industrial I/O hardware using a standard TCP/IP Ethernet connection.

Combined with analog, digital, and special-purpose I/O modules on a standard SNAP mounting rack, the SNAP Ethernet brain forms an I/O unit that can be used alone or as part of a distributed control system based on an Opto 22 industrial controller, such as the SNAP PAC standalone or rack-mounted programmable automation controllers.

A SNAP Ethernet system can be attached to existing Ethernet networks, making it easy to add monitoring and control where necessary. Or you can use standard Ethernet hardware to build an independent control network. You can also communicate with the system via a modem connection using Point-to-Point Protocol (PPP). A modem connection is ideal for remote locations or other places where an Ethernet network is not practical.

The SNAP Ethernet brain family includes three products:

*   The **SNAP-B3000-ENET** brain is designed to remotely interface with a mix of analog, digital, and serial modules. It is Factory Mutual approved.
*   The **SNAP-ENET-RTC** brain handles analog, digital, and serial signals and includes a battery-backed real-time clock.
*   The **SNAP-ENET-D64** brain is a digital-only processor. (Not recommended for new development. Use a SNAP Simple brain instead; see form #1452).

Used with SNAP mounting racks and SNAP I/O® modules, SNAP Ethernet brain functions include the following:

*   **Digital**—Input latching, on/off status, watchdog timer, and event/reactions. SNAP-B3000-ENET and SNAP-ENET-RTC brains also include high-speed counters when used with standard digital input modules, and quadrature counters when used with quadrature input modules. When used with a SNAP PAC controller and ioControl™ Professional, the SNAP-B3000-ENET and SNAP-ENET-RTC brains also include on-pulse and off-pulse measurement, time-proportional output (TPO), and pulse generation, including N pulses, continuous square waves, on-pulses, and off-pulses.
*   **Analog**—Thermocouple linearization (32-bit floating point for linearized values), minimum/maximum values, offset and gain,

scaling, output clamping, time-proportional output, filter weight, and watchdog timer. In addition, each brain provides 16 proportional integral derivative (PID) loops for local control. When used with a SNAP PAC controller and ioControl Professional, analog ramping is also available.

SNAP-B3000-ENET and SNAP-ENET-RTC brains can also use special-purpose SNAP modules on the same mounting rack:

*   **Serial communication modules**—Send and receive ASCII strings to and from attached serial devices, such as chart recorders and barcode readers.
*   **Profibus module**—Interface with PROFIBUS DP® networks, using a standard electrical interface.
*   **High-density digital modules**—Work with up to 32 digital inputs or 32 digital outputs on each module, for up to 512 digital points on a 16-module rack.

See for a detailed comparison of SNAP Ethernet I/O, SNAP Simple I/O, and SNAP Ultimate I/O features.

Configuring a SNAP Ethernet system is easy using PAC Manager available for free download from www.opto22.com.

Part Numbers

Part	Description
SNAP-B3000-ENET [Obsolete]	Analog/Digital/Serial Ethernet Brain
SNAP-ENET-D64 [Obsolete]	Digital-only Ethernet Brain (Not for new development)
SNAP-ENET-RTC [Obsolete]	Analog/Digital/Serial Ethernet Brain with Real-time Clock
RTCBATT	Replacement backup battery for SNAP-ENET-RTC brain

Replacement Information for Obsolete Parts

SNAP-B3000-ENET: This product is obsolete and no longer available. For new designs, you can use the SNAP-PAC-R1-B rack-mounted controller, which mounts on a B-series rack so you can keep your existing rack.

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The R1-B is substantially more powerful, can act as a controller as well as an I/O processor, and can communicate over a modem using PPP.

SNAP-ENET-D64: This product is obsolete and no longer available. No direct replacement is available. However, if you require PPP communication over a modem, we recommend the SNAP-PAC-R2 on-the-rack controller. Note that these SNAP PAC products require a different mounting rack.

SNAP-ENET-RTC: This product is obsolete and no longer available. The SNAP-PAC-EB1 brain is a suitable replacement, more powerful and costs less. Or, if you require PPP communication over a modem, we recommend the SNAP-PAC-R1 on-the-rack controller.

Communication Options

SNAP Ethernet brains can be part of a larger control system with a SNAP PAC programmable automation controller, or you can communicate directly with them using Ethernet networking or RS-232 serial connections.

Any of the following methods—or all of them simultaneously—can be used to interface with SNAP Ethernet I/O units:

- **ioControl Basic** or **ioControl Professional**—for a complete control system, the control strategy runs on a SNAP PAC programmable automation controller. ioControl Manager Basic is available for free download from www.opto22.com; ioControl Professional is purchased separately or as part of ioProject™ Professional.

- **Modbus/TCP driver**—for interfacing with any third-party software or hardware that uses the Modbus/TCP protocol.

- **OptoOPCServer**™—providing OLE for Process Control (OPC) 2.0 access for OPC clients. Purchase separately or as part of the ioProject Professional software suite.

- **SNMP messaging**—for communicating with SNMP-based enterprise management software.

- **OptoMMP**™ **Communications Toolkit**—for programming custom applications for the Ethernet brain to communicate using the OptoMMP memory-mapped protocol. The toolkit includes an ActiveX® component and a C++ class, and is available for free download from www.opto22.com.

- **Opto 22 FactoryFloor® 3.1 or newer** and an Opto 22 M4-series controller with a 100 Mbps Ethernet expansion card. Available separately. (Not recommended for new development; use ioProject instead.)

For more information about these communication methods and how to install and use the SNAP Ethernet brain, see Opto 22 form #1460, *SNAP Ethernet-Based I/O Units User's Guide*, and form #1465, *OptoMMP Protocol Guide*.

I/O Mounting Racks and Modules

SNAP Ethernet brains must be connected to the appropriate rack to avoid damage to the brain.

The analog/digital/serial SNAP-B3000-ENET and SNAP-ENET-RTC brains are connected to a SNAP B-series I/O mounting rack, which can hold either 4, 8, 12, or 16 Opto 22 SNAP I/O modules. SNAP 4-channel digital modules can be placed in any of the first eight positions; analog, serial, and higher density digital modules can be placed in any position on a B-series rack. Note that these brains cannot support analog modules with more than four points.

The digital-only SNAP-ENET-D64 brain is connected to a SNAP-D64RS I/O mounting rack, which can hold up to 16 4-channel digital input and output modules. This brain can be used only with 4-channel digital modules.
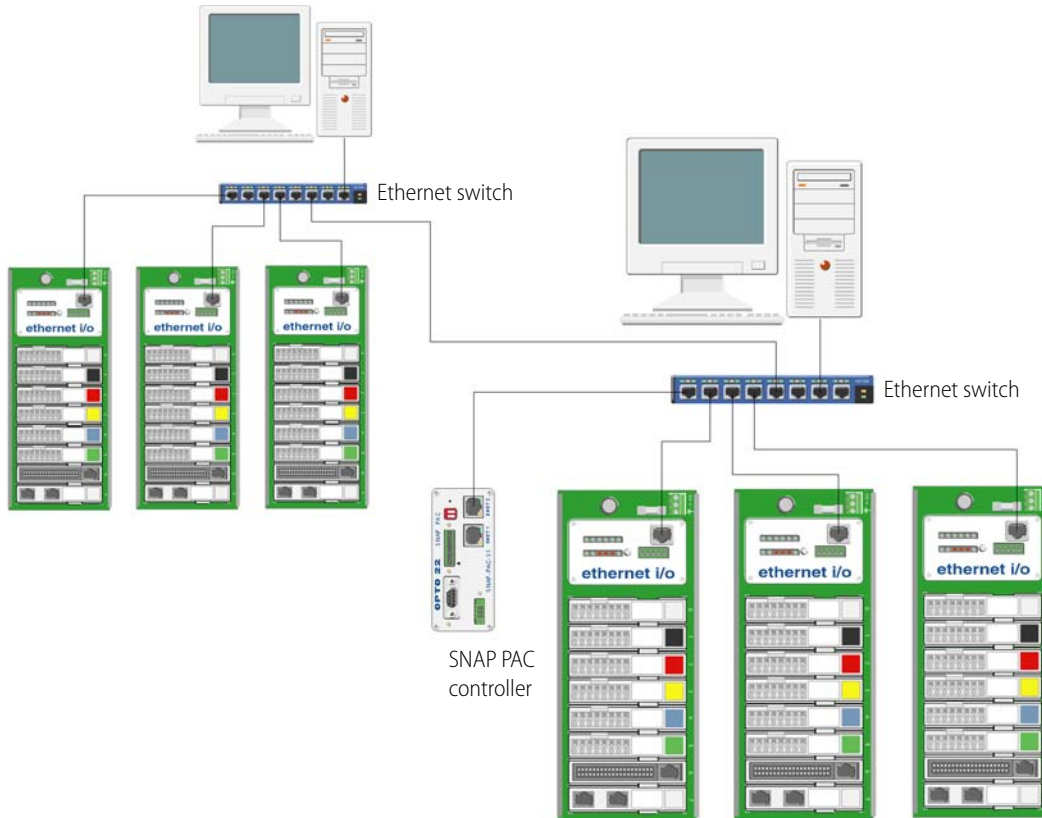
Other Features

All brains offer data streaming.

SNAP Ethernet brains provide both 10- and 100-Mbps Fast Ethernet compatibility, with automatic speed negotiation and a standard RJ-45 twisted-pair connector. The brains also include a serial port for maintenance and for modem communication using point-to-point protocol (PPP).

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SNAP ETHERNET BRAIN SYSTEM ARCHITECTURE

Network Configuration Example

Ethernet switch

Ethernet switch

SNAP PAC controller

Modem Example

Modem

Modem

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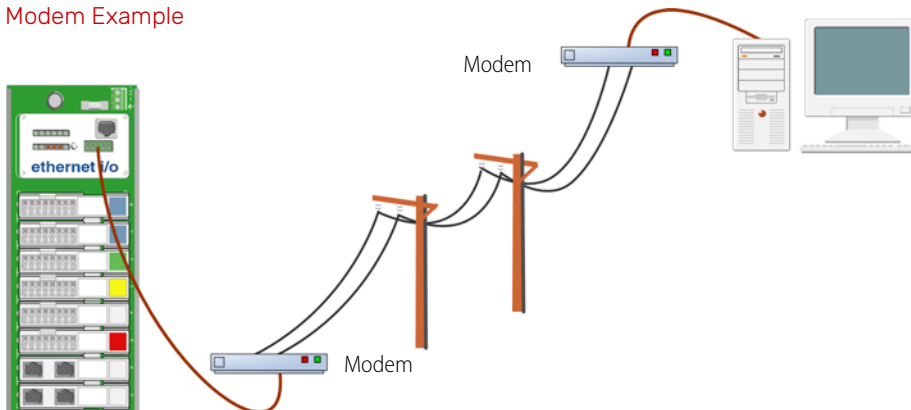
SPECIFICATIONS

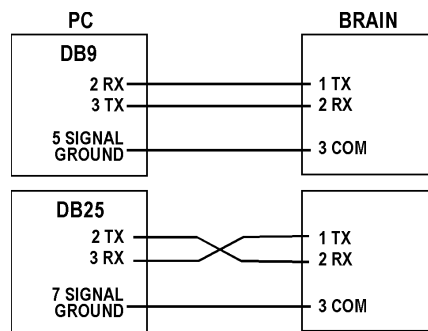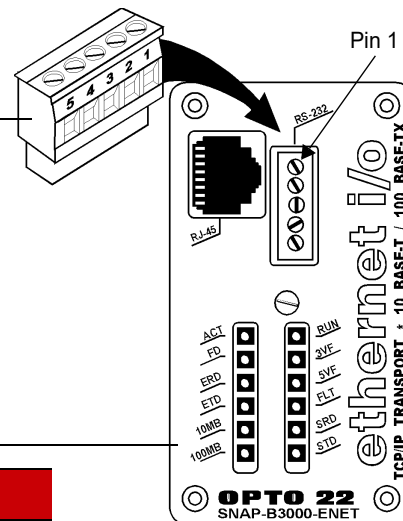| Specifications	SNAP Ethernet Brains
Power Requirements	5.0–5.2 VDC at 1.0 A maximum (does not include module power requirements)
Operating Temperature	0 to 70 °C
Storage Temperature	-40 to 85 °C
Humidity	0–95% humidity, non-condensing
Network Interface	IEEE 802.3 network, 10Base-T and 100Base-TX
Serial Port	RS-232 (for modem connection using PPP; also for programming and maintenance)
Serial Data Rates	Default is 19,200 baud; baud rate is soft-selectable from 2400 to 115,200 baud.
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.
Jumpers (Internal)	Boot to kernel/boot to loader; reset to factory defaults
Agency Approvals	SNAP-B3000-ENET & SNAP-ENET-D64: FM, DFARS SNAP-ENET-RTC: CE, FM, RoHS, DFARS; UKCA

RS-232 Serial Cable

PC

DB9
2 RX
3 TX
5 SIGNAL GROUND

DB25
2 TX
3 RX
7 SIGNAL GROUND

BRAIN
1 TX
2 RX
3 COM

1 TX
2 RX
3 COM

Serial Connector Pinouts

Pin	RS-232
1	TX
2	RX
3	COM
4	RTS
5	CTS

Pin 1

LED Descriptions

LED	Description	LED	Description
ACT	Network Activity	RUN	Normal Operation
FD	Full Duplex Mode	3VF	3 Volt Fault
ERD	Ethernet—Receive Data	5VF	5 Volt Fault
ETD	Ethernet—Transmit Data	FLT	Microprocessor Fault
10MB	Ethernet Link Detection at 10 Mbps	SRD	Serial—Receive Data
100MB	Ethernet Link Detection at 100 Mbps	STD	Serial—Transmit Data

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SNAP ETHERNET-BASED BRAIN COMPARISON CHART

This table compares Opto 22 Ethernet-based brains: SNAP Simple, SNAP Ethernet, and SNAP Ultimate.

FEATURE		SNAP Simple I/O — SNAP-ENET-S64	SNAP Ethernet I/O [Obsolete] — SNAP-B3000-ENET / SNAP-ENET-RTC	SNAP Ethernet I/O [Obsolete] — SNAP-ENET-D64	SNAP Ultimate I/O — SNAP-UP1-ADS	SNAP Ultimate I/O — SNAP-UP1-D64	SNAP Ultimate I/O — SNAP-UP1-M64
I/O modules supported	4-channel digital	■	■	■	■	■	■
	High-density digital (>4 channels)	■	■		■		■
	2- and 4- channel analog	■	■		■		■
	8-channel analog	■			■		■
	Serial communication modules (RS-232, RS-485/422, Profibus®, Wiegand®)	■	■		■		■
Digital I/O points	Input latching	■	■	■	■	■	■
	On/off status	■	■	■	■	■	■
	Watchdog timer[1]	■	■	■	■	■	■
	High-speed counters (20 kHz)[1]		■		■		
	Quadrature counters[2]		■		■		
	On-pulse and off-pulse measurement[1,3]		■		■		
	TPO (time-proportional output)[3]		■		■		
	Pulse generation (N pulses, continuous square wave, on-pulse, and off-pulse)[3]		■		■		
Analog I/O points	Thermocouple linearization (32-bit floating point for linearized values)	■	■		■		■
	Minimum/maximum values	■	■		■		■
	Offset and gain	■	■		■		■
	Scaling	■	■		■		■
	Time-proportional output	■	■		■		■
	Output clamping	■	■		■		■
	Filter weight	■	■		■		■
	Watchdog timer	■	■		■		■
	Ramping[3]		■		■		
Serial events			■		■		■
PID logic on the brain			16 PIDs		32 PIDs		32 PIDs
Digital events[1]			■	■	■	■	■
Alarm events			■		■		■
Timers[1]			■	■	■	■	■

FEATURE	SNAP Simple I/O	SNAP Ethernet I/O [Obsolete]		SNAP Ultimate I/O		
	SNAP-ENET-S64	SNAP-B3000-ENET SNAP-ENET-RTC	SNAP-ENET-D64	SNAP-UP1-ADS	SNAP-UP1-D64	SNAP-UP1-M64
Event messages		■	■	■	■	■
UDP Streaming	■	■	■	■	■	■
Email (SMTP client)		■	■	■	■	■
OPC driver	■	■	■	■	■	■
Data logging in the brain		■		■		■
Security (IP filtering, port access)	■	■	■	■	■	■
Realtime clock (RTC)		■[4]		■	■	■
I/O point data mirroring		■		■		■
Memory map copying		■		■		■
Scratch Pad area—bits		■	■			
Scratch Pad area—bits, floats, integers, strings				■	■	■
SNMP (network management of I/O & variables)		■	■	■	■	■
PPP (dial-up and radio modems)		■	■	■	■	■
FTP server and client				■	■	■
Modbus/TCP	■	■	■	■	■	■
Ethernet network	■	■	■	■	■	■
Serial (RS-232)				■	■	■
Runs ioControl strategies				■	■	■
ioControl compatibility (using SNAP PAC or SNAP-LCE controller or SNAP Ultimate I/O)	■	■	■	■	■	■
OptoControl compatibility (using Opto 22 controller with Ethernet card. Not for new development.)	■	■	■			
Mounting rack	SNAP-M racks	SNAP-B racks	SNAP-D64RS	SNAP-B racks	SNAP-D64RS	SNAP-M racks
Number of modules per mounting rack	4, 8, 12, or 16	4, 8, 12, or 16	16	4, 8, 12, or 16	16	4, 8, 12, or 16
Maximum number of modules allowed per I/O unit (with largest rack)	16 4-ch dig 16 HDD[5] 16 analog 8 serial	8 4-ch dig 16 HDD[5] 16 analog 8 serial	16 4-ch digital	8 4-ch dig 16 HDD[5] 16 analog 8 serial	16 4-ch digital	16 4-ch dig 16 HDD[5] 16 analog 8 serial

1 Four-channel digital modules only; not available on high-density digital modules
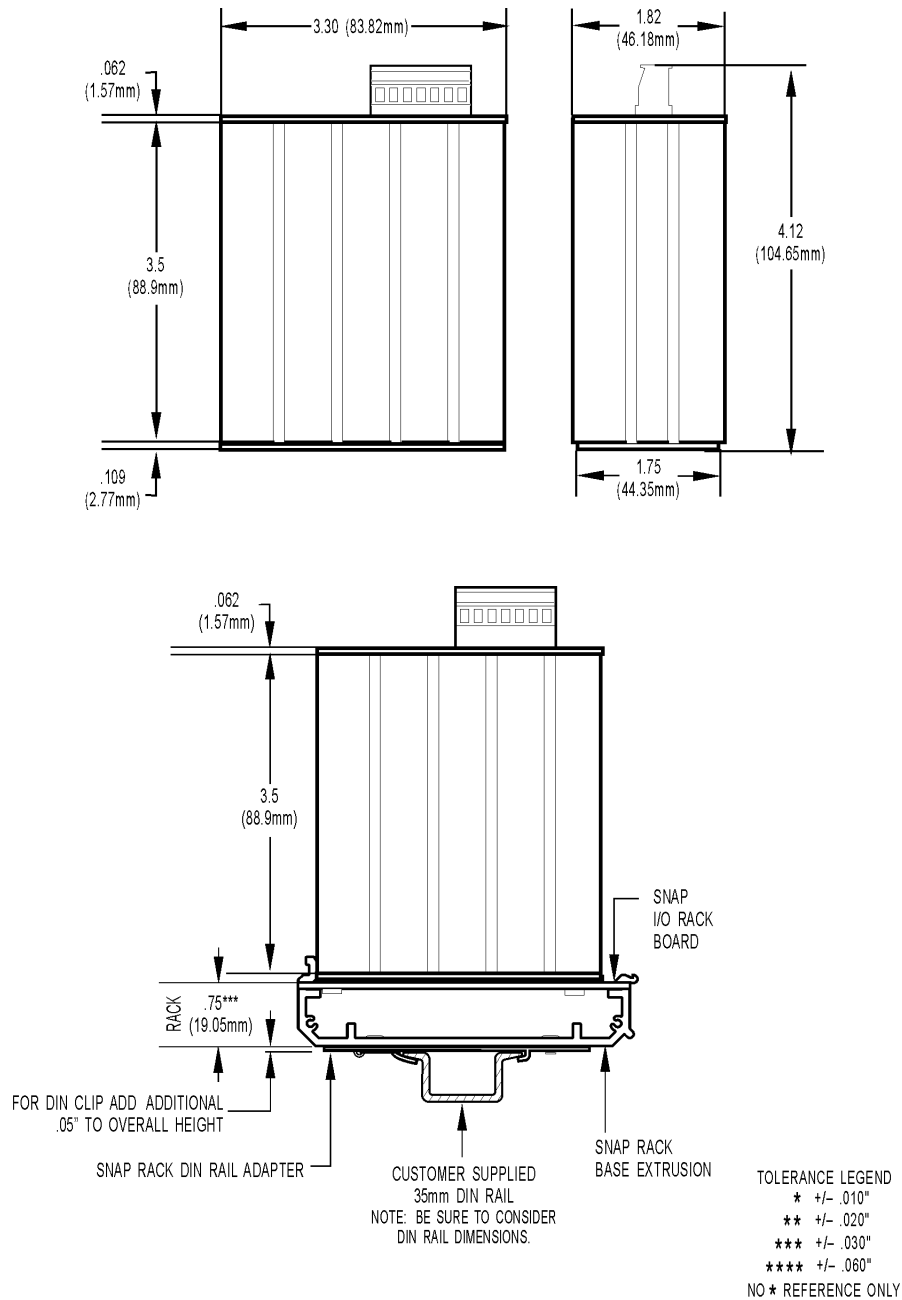2 Requires a SNAP quadrature input module (SNAP-IDC5Q)
3 Available when used with ioControl Professional and a SNAP PAC controller
4 Applies to SNAP-ENET-RTC, not to SNAP-B3000-ENET
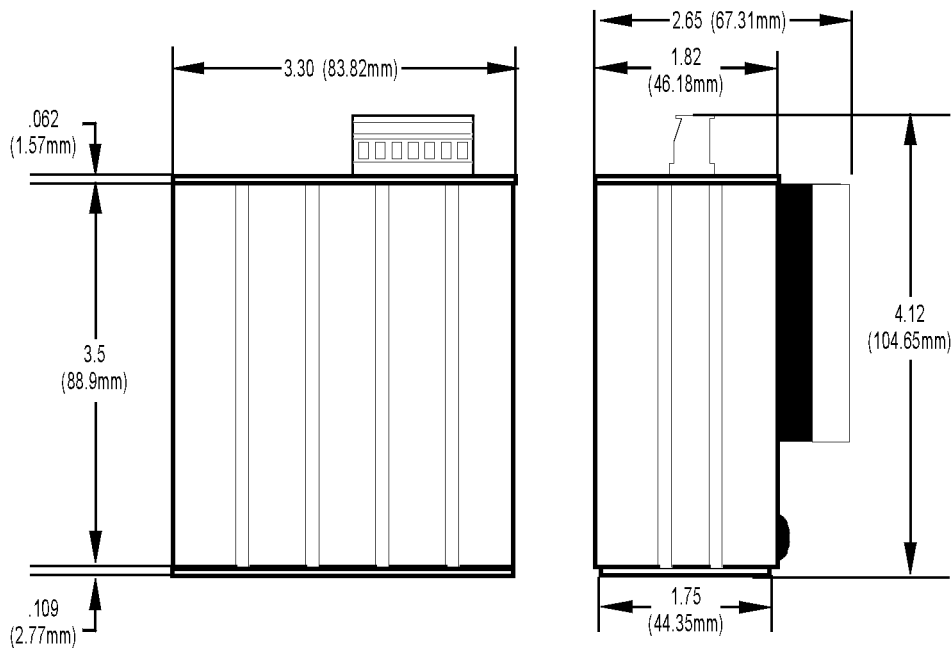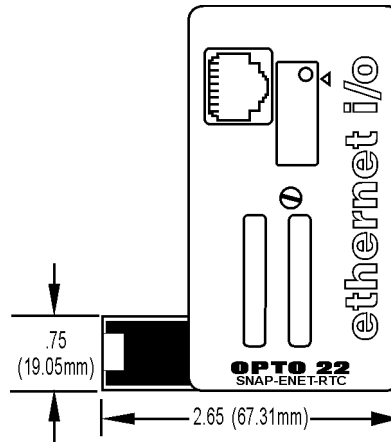5 High-density digital

DIMENSIONS: SNAP-B3000-ENET AND SNAP-ENET-D64

3.30 (83.82mm)

.062 (1.57mm)

3.5 (88.9mm)

.109 (2.77mm)

1.82 (46.18mm)

4.12 (104.65mm)

1.75 (44.35mm)

.062 (1.57mm)

3.5 (88.9mm)

RACK .75*** (19.05mm)

SNAP I/O RACK BOARD

FOR DIN CLIP ADD ADDITIONAL .05" TO OVERALL HEIGHT

SNAP RACK DIN RAIL ADAPTER

CUSTOMER SUPPLIED 35mm DIN RAIL
NOTE: BE SURE TO CONSIDER DIN RAIL DIMENSIONS.

SNAP RACK BASE EXTRUSION

TOLERANCE LEGEND
* +/- .010"
** +/- .020"
*** +/- .030"
**** +/- .060"
NO * REFERENCE ONLY

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DIMENSIONS: SNAP-ENET-RTC

The SNAP-ENET-RTC contains a real-time clock to time stamp messages. The backup battery for the clock is attached on the side of the brain as shown in the diagrams at right and below. For a replacement backup battery, order part number RTCBATT.

Except for the addition of the battery holder, the dimensions of the SNAP-ENET-RTC are the same as the dimensions for the other SNAP Ethernet brains, shown on the previous page.

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PRODUCTS

Opto 22 develops and manufactures reliable, easy-to-use, open standards-based hardware and software products. Industrial automation, process control, remote monitoring, data acquisition, and industrial internet of things (IIoT) applications worldwide all rely on Opto 22.

groov RIO®

groov RIO edge I/O offers a single, compact, PoE-powered industrial package with web-based configuration and IIoT software built in, support for multiple OT and IT protocols, and security features like a device firewall, data encryption, and user account control.

Standing alone, *groov* RIO connects to sensors, equipment, and legacy systems, collecting and securely publishing data from field to cloud. Choose a universal I/O model with thousands of possible field I/O configurations, with or without Ignition from Inductive Automation®, or a RIO EMU energy monitoring unit that reports 64 energy data values from 3-phase loads up to 600 VAC, Delta or Wye.

You can also use *groov* RIO with a Modbus/TCP master or as remote I/O for a *groov* EPIC system.

groov EPIC® System

Opto 22's *groov* Edge Programmable Industrial Controller (EPIC) system gives you industrially hardened control with a flexible Linux®-based processor with gateway functions, guaranteed-for-life I/O, and software for your automation and IIoT applications.

groov EPIC Processor

The heart of the system is the *groov* EPIC processor. It handles a wide range of digital, analog, and serial functions for data collection, remote monitoring, process control, and discrete and hybrid manufacturing.

In addition, the EPIC provides secure data communications among physical assets, control systems, software applications, and online services, both on premises and in the cloud. No industrial PC needed.

Configuring and troubleshooting I/O and networking is easier with the EPIC's integrated high-resolution color touchscreen. Authorized users can manage the system locally on the touchscreen, on a monitor connected via the HDMI or USB ports, or on a PC or mobile device with a web browser.

groov EPIC I/O

groov I/O connects locally to sensors and equipment. Modules have a spring-clamp terminal strip, integrated wireway, swing-away cover, and LEDs indicating module health and discrete channel status. *groov* I/O is hot swappable, UL Hazardous Locations approved, and ATEX compliant.

groov EPIC Software

The *groov* EPIC processor comes ready to run the software you need:

- Programming: Choose flowchart-based PAC Control, CODESYS Development System for IEC61131-3 compliant programs, or secure shell access (SSH) to the Linux OS for custom applications
- Node-RED for creating simple IIoT logic flows from pre-built nodes
- Efficient MQTT data communications with string or Sparkplug data formats
- HMI: *groov* View to build your own HMI viewable on touchscreen, PCs, and mobile devices; PAC Display for a Windows HMI; Node-RED dashboard UI
- Ignition or Ignition Edge® from Inductive Automation (requires license purchase) with OPC-UA drivers to Allen-Bradley®, Siemens®, and other control systems, and MQTT communications

Older products

From solid state relays, to world-famous G4 and SNAP I/O, to SNAP PAC controllers, older Opto 22 products are still supported and working hard at thousands of installations worldwide. You can count on us for the reliability and service you expect, now and in the future.

QUALITY

Founded in 1974, Opto 22 has established a worldwide reputation for high-quality products. All are made in the U.S.A. at our manufacturing facility in Temecula, California.

Because we test each product twice before it leaves our factory rather than testing a sample of each batch, we can afford to guarantee most solid-state relays and optically isolated I/O modules for life.

FREE PRODUCT SUPPORT

Opto 22's California-based Product Support Group offers free technical support for Opto 22 products from engineers with decades of training and experience. Support is available in English and Spanish by phone or email, Monday–Friday, 7 a.m. to 5 p.m. PST.

Support is always available on our website, including free online training at OptoU, how-to videos, user's guides, the Opto 22 KnowledgeBase, and OptoForums.

PURCHASING OPTO 22 PRODUCTS

Opto 22 products are sold directly and through a worldwide network of distributors, partners, and system integrators. For more information, contact Opto 22 headquarters at **800-321-6786** (toll-free in the U.S. and Canada) or **+1-951-695-3000**, or visit our website at www.opto22.com.

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