

SNAP PAC S-Series Controllers

Features

- Up to 32 PAC Control flowcharts running simultaneously
- Two 10/100 Mbps Ethernet interfaces for host and I/O communication over standard Ethernet networks
- SNAP-PAC-S1: One RS-485 serial port for connection to Opto 22 serial I/O units and two RS-232 serial ports, one with full handshaking for PPP host connection
- SNAP-PAC-S2: four serial ports, all software configurable for either RS-232 or RS-485 (2-wire or 4-wire); ideal for multiple serial I/O units
- Multiple protocol support: TCP/IP, EtherNet/IP™, Modbus®/TCP, SNMP, FTP, and OptoMMP™
- FTP server/client capability; includes file system and removable storage (2 GB microSD card)

Description

The SNAP-PAC-S1, SNAP-PAC-S1-FM, and SNAP-PAC-S2 programmable automation controllers provide powerful, real-time control and communication to meet your industrial control, monitoring, and data acquisition needs. As part of the Opto 22 SNAP PAC System, one of these compact, industrially hardened controllers can handle multiple control, automation, and data acquisition tasks involving digital and analog control, serial string handling, PID, and enterprise connectivity.

Connecting to Opto 22 serial- and Ethernet-based I/O systems, a SNAP PAC S-series controller runs control programs written in Opto 22's PAC Control™ software to monitor and control a wide range of devices and equipment. SNAP PAC S-series controllers are well suited to original equipment manufacturers (OEMs), system integrators, and end-users in process control, discrete manufacturing, or hybrid industries and applications.

A SNAP PAC S-series controller simultaneously runs up to 32 PAC Control flowcharts, although the PAC Control strategy can actually contain a much larger number of charts. The total number of flowcharts is limited only by the controller memory available for strategy storage.

Ethernet Communication

SNAP PAC S-series programmable automation controllers communicate over standard 10/100 Mbps Ethernet networks and can be attached to existing wired or wireless Ethernet networks. The controllers can also be used in an independent control network built with standard, off-the-shelf Ethernet hardware.



SNAP-PAC-S2 controller

SNAP PAC S-series controllers include two 10/100 Mbps Ethernet interfaces for networking through an Ethernet switch to Ethernet hosts, as well as SNAP PAC brains and I/O, which provide local intelligence and the connections to digital and analog sensors and actuators as well as serial devices. These independent Ethernet ports have separate IP addresses that can be used with PAC Project™ Professional software to set up redundant network links to safeguard the availability and reliability of an I/O system, or to segment a control system's network from the enterprise LAN.

Serial Communication

SNAP PAC S-series controllers provide RS-232 and RS-485 communication as follows:

The **SNAP-PAC-S1** and **SNAP-PAC-S1-FM** have two RS-232 serial ports that support general-purpose communication with serial devices; you can send and receive data from one or two serial devices connected directly to the controller. Port 0 can be connected to a modem using PPP (Point-to-Point Protocol). These controllers also have one pluggable two-wire RS-485 port that can be used for SNAP PAC or *mistic* serial I/O units. For additional serial interfaces, you can add one or more SNAP serial communication modules on SNAP PAC racks connected to the controller.

Part Numbers

Part	Description
SNAP-PAC-S1	Ethernet-based programmable automation controller with 2 Ethernet interfaces
SNAP-PAC-S1-FM	Ethernet-based programmable automation controller with 2 Ethernet interfaces, Factory Mutual approved
SNAP-PAC-S2	Ethernet-based programmable automation controller with 2 Ethernet interfaces and 4 serial ports
SNAP-PSDIN	SNAP-PAC-S1 controller DIN-rail adapter
SNAP-S2DIN	SNAP-PAC-S2 controller DIN-rail adapter

The **SNAP-PAC-S2** has four serial ports that can each be configured using PAC Manager as either RS-232 or RS-485 (2-wire or 4-wire). These serial ports can be used for I/O or for general-purpose serial communication. For the default configuration settings of these ports, see form 1592, the *SNAP PAC S-series User's Guide*.

Configured as RS-232, the ports support remote serial device communication, and any one of the ports can be configured as a PPP modem connection for creating a TCP/IP network over PSTN (Public Switched Telephone Network) lines. Configured as RS-485, the serial ports connect to legacy Opto 22 *mistic™* I/O units, including the serial B3000 brain and remote *mistic* bricks, and to SNAP PAC SB-series serial brains.

For additional serial host interfaces, you can add one or more SNAP serial communication modules on attached SNAP Ethernet-based I/O units.

Backward Compatibility

S-series controllers have RS-485 serial interfaces for connecting to Opto 22's legacy *mistic* I/O units. The SNAP-PAC-S1 and SNAP-PAC-S1-FM have one RS-485 port, and the SNAP-PAC-S2 can be configured with up to four. This connectivity with legacy serial-based I/O systems, combined with PAC Control Professional's ability to import control programs (or *strategies*) written in OptoControl™ software, provides a migration path to integrate older Opto 22 I/O systems into modern control hardware running on Ethernet networks. For detailed information on updating control strategies and integrating legacy control hardware into modern systems, see the *FactoryFloor to PAC Project Migration Technical Note* (Opto 22 form 1692).

Software

SNAP PAC controllers use Opto 22's **PAC Project** Microsoft® Windows®-compatible automation software for control programming, human-machine-interface (HMI) development, and OPC and database connectivity. Two versions of PAC Project are available:

- **PAC Project Basic** includes PAC Control for developing control programs, PAC Display™ for creating operator interfaces, and PAC Manager™ configuration software.
- **PAC Project Professional** adds expanded versions of PAC Control and PAC Display plus OptoOPCServer™ software for exchanging data with OPC 2.0-compliant client software applications and OptoDataLink™ for sharing SNAP PAC System data with ODBC-compliant databases.

The PAC Project software suite includes the following applications:

SNAP PAC S-Series Controllers

PAC Control Basic is a graphical, flowchart-based programming tool for machine control and process applications. Using PAC Control, you create, download, and run strategies on a SNAP PAC controller. In addition to flowchart programming with subroutine capability, PAC Control includes a powerful, built-in scripting language based on C and other procedural languages. **PAC Control Professional** adds capabilities to import OptoControl strategies, to support *mistic* I/O units, and to use a SNAP PAC controller's independent Ethernet ports to segment communication links.

PAC Display Basic is an intuitive HMI package for building operator interfaces, or *projects*, for communicating with a SNAP PAC controller. PAC Display offers a full-featured HMI including alarming, trending, and a built-in library of 3,000 industrial automation graphics. **PAC Display Professional** adds the ability to import projects created in OptoDisplay, part of the Opto 22 FactoryFloor® software suite, and to use redundant communication links on SNAP PAC controllers. PAC Display Professional can also connect to Ethernet-based FactoryFloor controllers running OptoControl strategies or ioProject controllers running ioControl strategies.

OptoOPCServer (PAC Project Professional only) is a fast, efficient OPC 2.0-compliant server for communicating with many Opto 22 products, including SNAP PAC controllers running PAC Control strategies, SNAP PAC brains, SNAP Ultimate controller/brains, SNAP Ethernet and SNAP Simple brains, and Ethernet-based FactoryFloor controllers running OptoControl strategies.

Using OptoOPCServer, you can consolidate data from all these Opto 22 systems into the OPC client software of your choice, such as third-party HMI and data acquisition packages, and custom software applications you create with tools such as Visual C++®.

OptoDataLink (PAC Project Professional only) transparently provides multiple connections for data exchange with popular databases such as Microsoft SQL Server, Microsoft Access, and MySQL. OptoDataLink connects your SNAP PAC system with the tools used for making business decisions, bringing realtime, accurate data to decision makers.

PAC Manager is a utility application for assigning IP addresses to SNAP PAC controllers and brains, reading or changing basic controller configuration, upgrading firmware, and inspecting or testing controllers and I/O.

Software Availability

PAC Project Basic is included with SNAP PAC controllers and is a free download from the Opto 22 website. PAC Project Professional is available for purchase. You can also separately purchase PAC Control Professional, PAC Display Professional, OptoOPCServer, and OptoDataLink as needed. For additional information, see the *PAC Project Data Sheet*, Opto 22 form 1699.

SNAP PAC S-Series Controllers

Technical Specifications

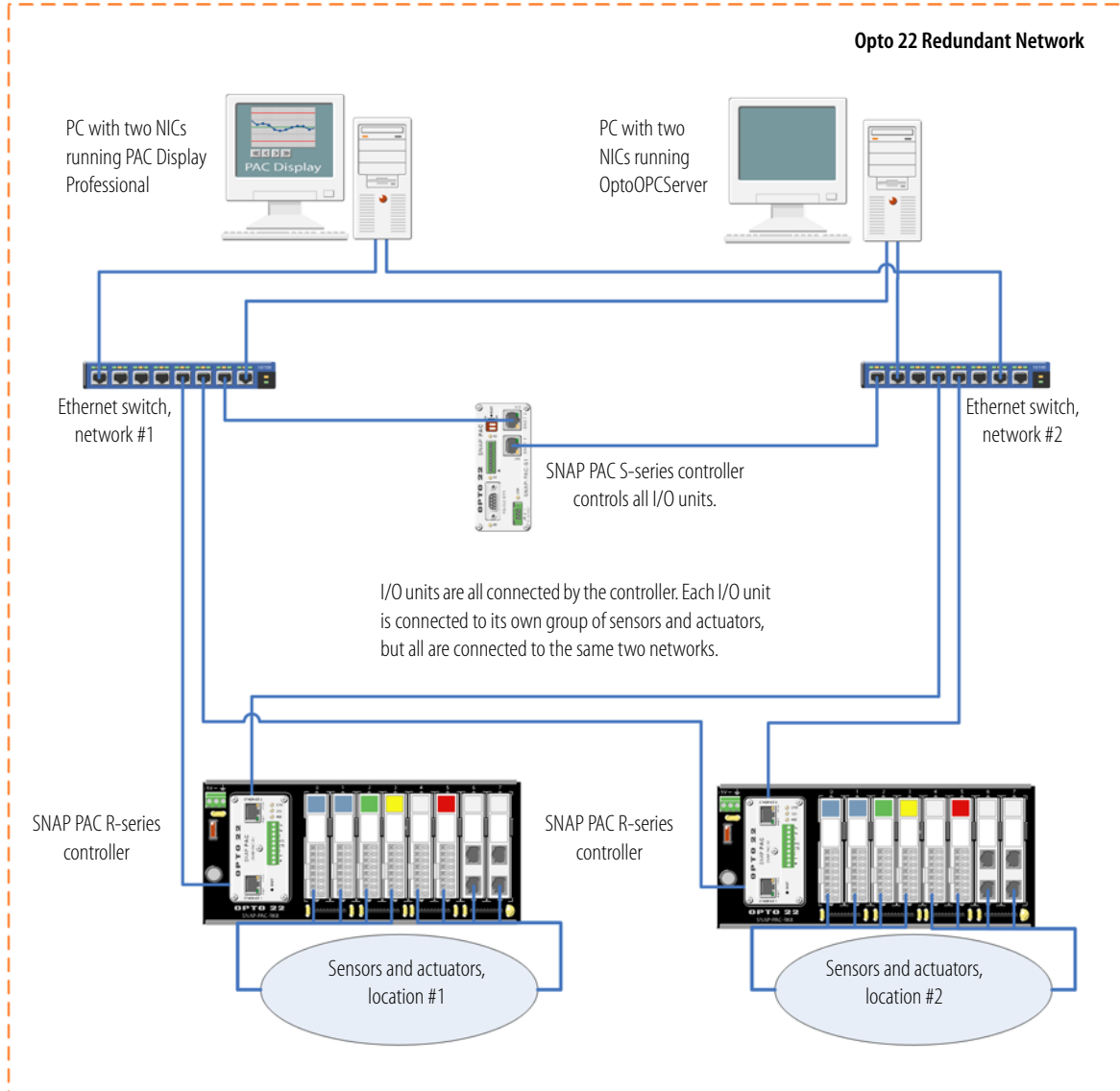
Processor	266 MHz 32-bit ColdFire® 5475 with integrated floating-point unit (FPU)
Memory Total RAM Battery-backed RAM Flash	32 MB (16 MB available for PAC Control strategy) 8 MB 16 MB (7.5 MB available for PAC Control strategy; 4 MB available for file storage)
Removable storage	(Models manufactured November 2008 and later; requires firmware R8.4 or higher) MicroSD card slot: supports MicroSD card up to 2 GB maximum
Backup battery	SNAP-PAC-S1: User-replaceable 3.6-volt TL 5242 /W lithium, 10-year minimum power-off data retention (replacement part number: G4BATT32) SNAP-PAC-S2: Rechargeable (recharges whenever the brain has power), 1-year power-off data retention
Ethernet Communication (host and I/O)	Two independent 10/100 Mbps Ethernet network interfaces (RJ-45 connectors). Each interface has a separate IP address (separate subnet).
Serial Communication Range (serial multidrop) SNAP-PAC-S1 RS-232 serial RS-485 serial SNAP-PAC-S2	For Opto 22 devices, 32 stations maximum between repeaters (controller plus 31 serial I/O units); up to 3000 ft (914 m) between repeaters Two RS-232 serial ports (one DB-9 and one pluggable connector); one port has full handshaking. PPP is supported only on port 0. One RS-485 serial port (pluggable connector); two-wire RS-485; optional <i>mistic</i> signal interrupts Four serial ports that can be used as general purpose ports or for serial I/O units; each port is software configurable as either RS-232 (Tx, Rx, COM, DTR, DCD, RTS, CTS) or as RS-485 (2-wire, 4-wire, optional termination, optional biasing); optional <i>mistic</i> signal interrupts
I/O unit compatibility Ethernet-based I/O units Serial-based I/O units	Opto 22 SNAP PAC R-series, SNAP PAC EB-series, SNAP SIO, SNAP EIO, and SNAP UIO brains SNAP PAC SB-series, Serial B3000, SNAP-BRS, B100/B200, <i>mistic</i> remote bricks (G4D16R, G4D32RS, G4A8R)
Power requirements	8–32 VDC ±0.5, 10 VA maximum (SNAP-PAC-S1 controllers with serial numbers below 500,000 use 8–24 VDC)
Operating temperature Storage temperature Humidity	0 °C to 60 °C -40 °C to 85 °C 0% to 95% relative humidity, non-condensing
Software PAC Project Basic PAC Project Professional	Includes programming, HMI software, and configuration software; included with purchase of controller. PAC Project Basic plus OPC 2.0-compliant OPC server, OptoControl strategy and OptoDisplay project importing, support for serial <i>mistic</i> I/O units, and Ethernet link redundancy support.
Other features	Multiple protocol support including TCP/IP, FTP, SNMP v2.0c (with firmware 8.2a), Modbus/TCP, EtherNet/IP™, and OptoMMPT™. Real-time clock FTP server/client with file system (in RAM and in removable storage) Ethernet link redundancy or network segmenting

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System Architecture

SNAP PAC S-Series Controller in Redundant Network Configuration

The network shown in this diagram requires PAC Control Professional and PAC Display Professional.



This diagram shows a SNAP PAC S-series controller connected to two separate Ethernet networks. This configuration addresses the concern that an Ethernet network may fail or need maintenance, leaving the PC running OptoOPCServer, the PC running PAC Display, the controller, and the I/O units unable to communicate.

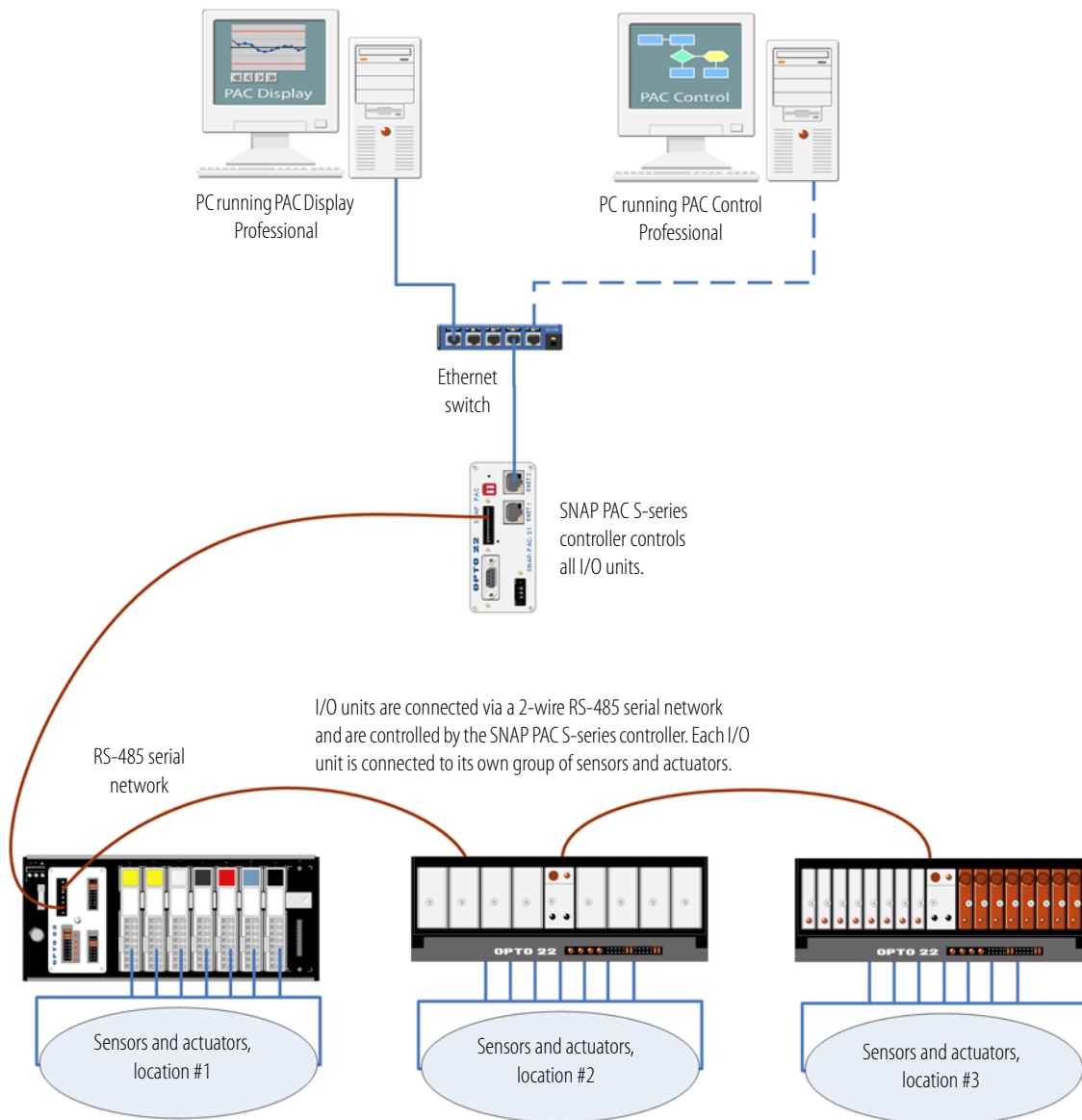
In this configuration, if one network goes down, devices can still communicate on the other. Each PC has two network interface cards (NICs), and the SNAP PAC S-series controller and the I/O units (SNAP PAC R-series) have two network interfaces as well.

SNAP PAC S-Series Controllers

System Architecture (continued)

SNAP-PAC-S1 Controller and Serial-based I/O Units

The network shown in this diagram requires PAC Control Professional and PAC Display Professional.



This diagram shows a SNAP PAC S-series controller connected to multiple Opto 22 serial-based I/O units over an RS-485 serial network. The controller is also connected to a larger, separate enterprise Ethernet network to provide process data to a PC running Opto 22's PAC Display HMI software.

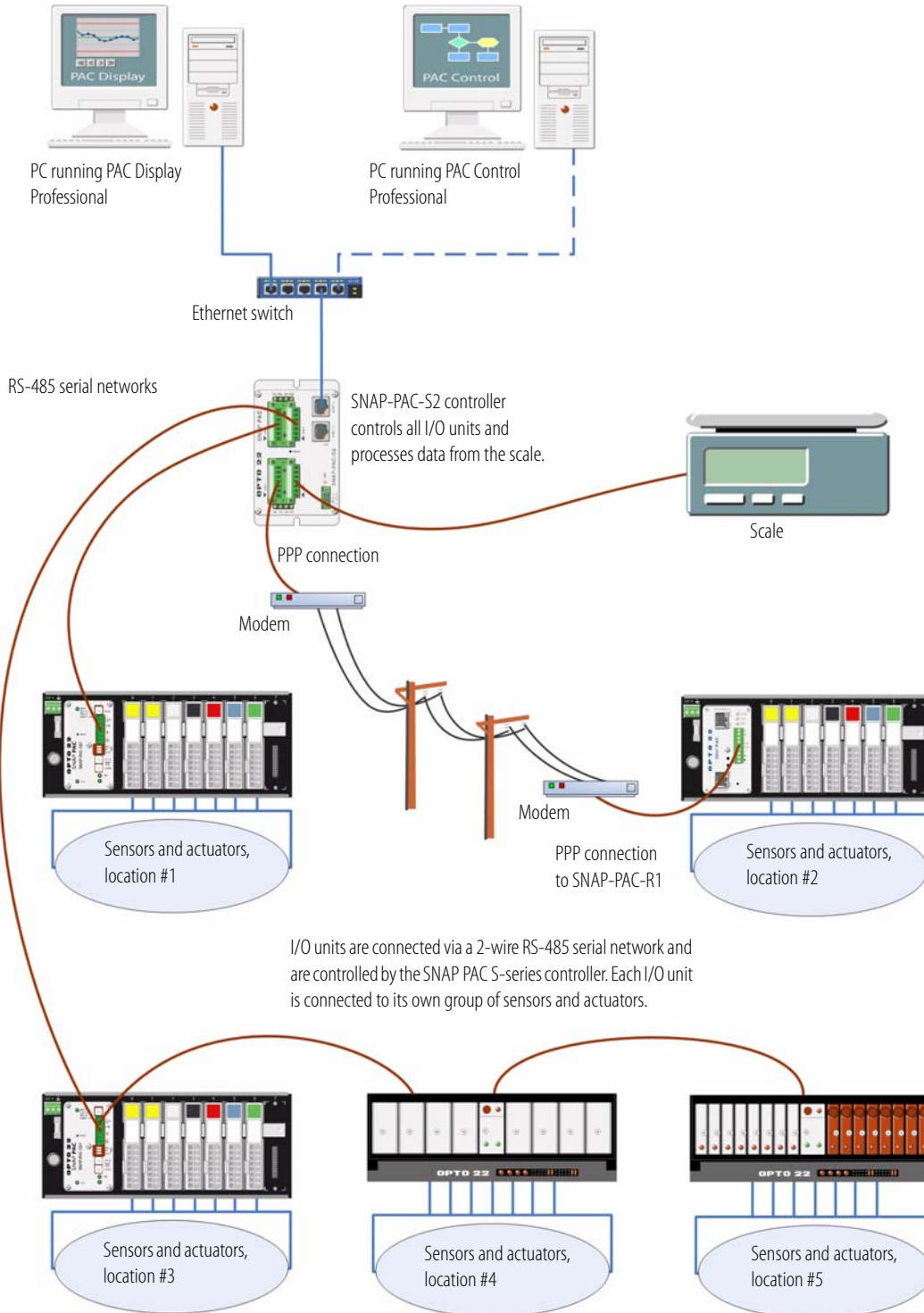
The diagram also shows a PC running PAC Control Professional; the control program (or *strategy*) that runs on the SNAP controller was developed in this application. Once developed, the strategy is downloaded to the controller and runs independently.

SNAP PAC S-Series Controllers

System Architecture (continued)

SNAP-PAC-S2 Controller and Serial-based I/O Units

The network shown in this diagram requires PAC Control Professional and PAC Display Professional.

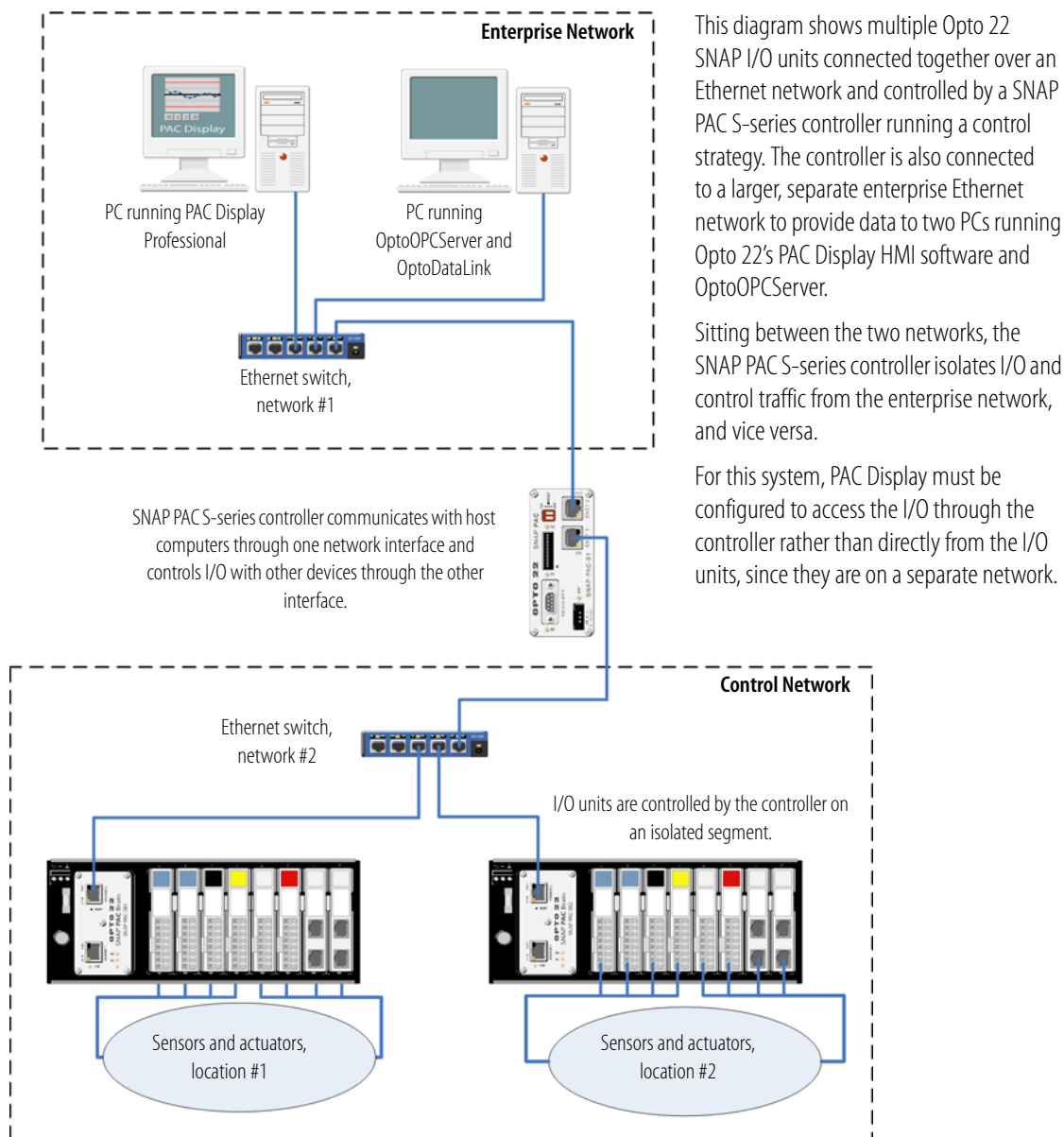


SNAP PAC S-Series Controllers

System Architecture (continued)

SNAP PAC S-series Controller on an Ethernet Network

The network shown in this diagram requires PAC Control Professional and PAC Display Professional.



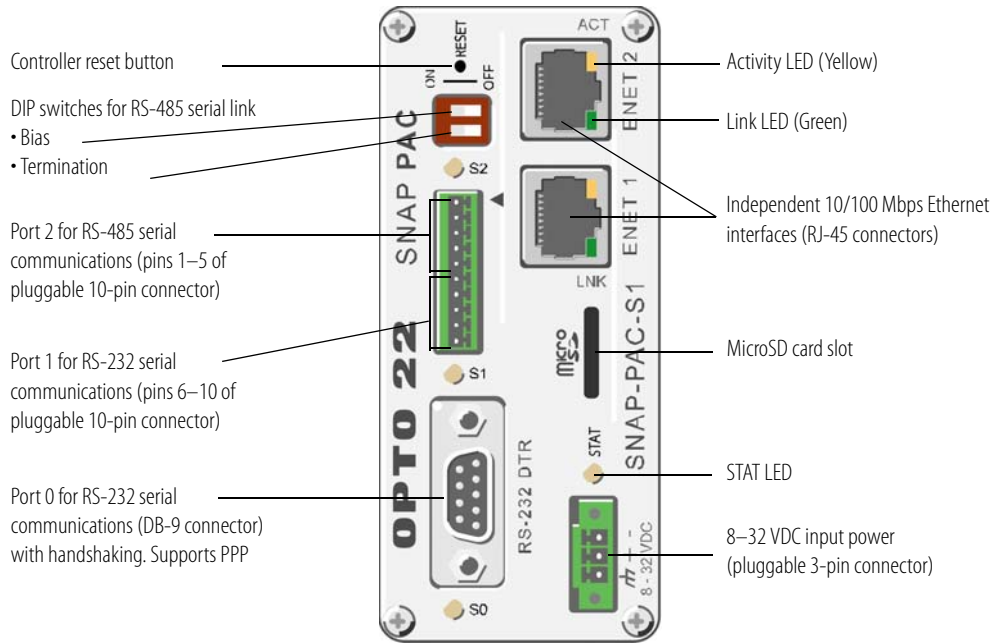
This diagram shows multiple Opto 22 SNAP I/O units connected together over an Ethernet network and controlled by a SNAP PAC S-series controller running a control strategy. The controller is also connected to a larger, separate enterprise Ethernet network to provide data to two PCs running Opto 22's PAC Display HMI software and OptoOPCServer.

Sitting between the two networks, the SNAP PAC S-series controller isolates I/O and control traffic from the enterprise network, and vice versa.

For this system, PAC Display must be configured to access the I/O through the controller rather than directly from the I/O units, since they are on a separate network.

SNAP PAC S-Series Controllers

SNAP-PAC-S1 Connectors and Indicators



Status and Activity LEDs

Indicator	Description
S0	RS-232 serial activity on port 0
S1	RS-232 serial activity on port 1
S2	RS-485 serial activity
STAT	Startup status and control program operational status
ACT	Ethernet network activity
LINK	Link established with Ethernet network

Port 0 for RS-232 serial (DB-9 connector)

Pin	Description	Signal Direction
1	DCD	In
2	RX	In
3	TX	Out
4	DTR	Out
5	COM	
6	DSR	In
7	RTS	Out
8	CTS	In
9	RI	In

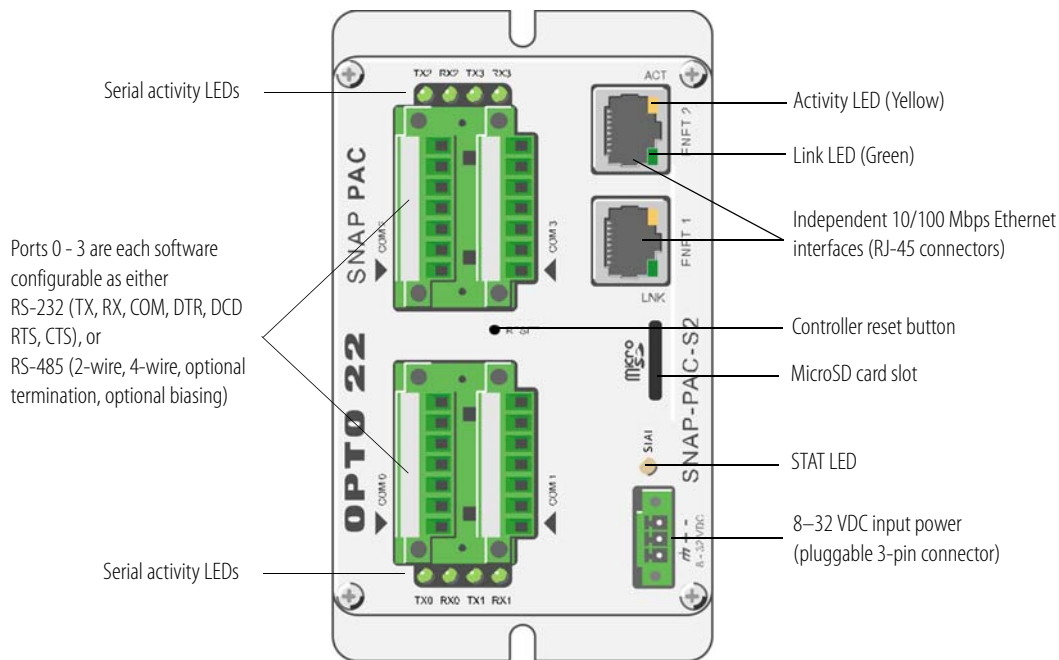
Ports 1 and 2 for RS-485 and RS-232 serial

	Pin	Description	Signal Direction
Port 2 for RS-485 serial (2-Wire)	1	TX/RX+	In/Out
	2	TX/RX-	In/Out
	3	SIG COM*	
	4	IRQ+	In
	5	IRQ-	In
Port 1 for RS-232 serial	6	TX	Out
	7	RX	In
	8	GND	
	9	RTS	Out
	10	CTS	In

* Isolated ground

SNAP PAC S-Series Controllers

SNAP-PAC-S2 Connectors and Indicators



RS-485 and RS-232 Ports¹

Pin	RS-232	Signal Direction	RS-485	Signal Direction
1	TX	Out	TX/RX+	In/Out
2	RX	In	TX/RX-	In/Out
3	COM ²		COM ²	
4	RTS	Out	RX+ (4 wire)	In
5	CTS	In	RX- (4 wire)	In
6	DTR	Out	IRQ+	In
7	DCD	In	IRQ-	In

¹ **CAUTION: Do not use communication port connectors from a legacy OptoControl controller***. Legacy connectors will fit in a SNAP-PAC-S2, but the pin orientation is different. Instead, use the connectors supplied with the SNAP-PAC-S2 controller.

² Isolated ground. (Each channel is isolated from the others.)

*Legacy OptoControl Controllers:

G4LC32	G4LC32ISA-LT	M4RTU
G4LC32SX	M4	SNAP-LCM4
G4LC32ISA	M4IO	SNAP-LCSX/PLUS

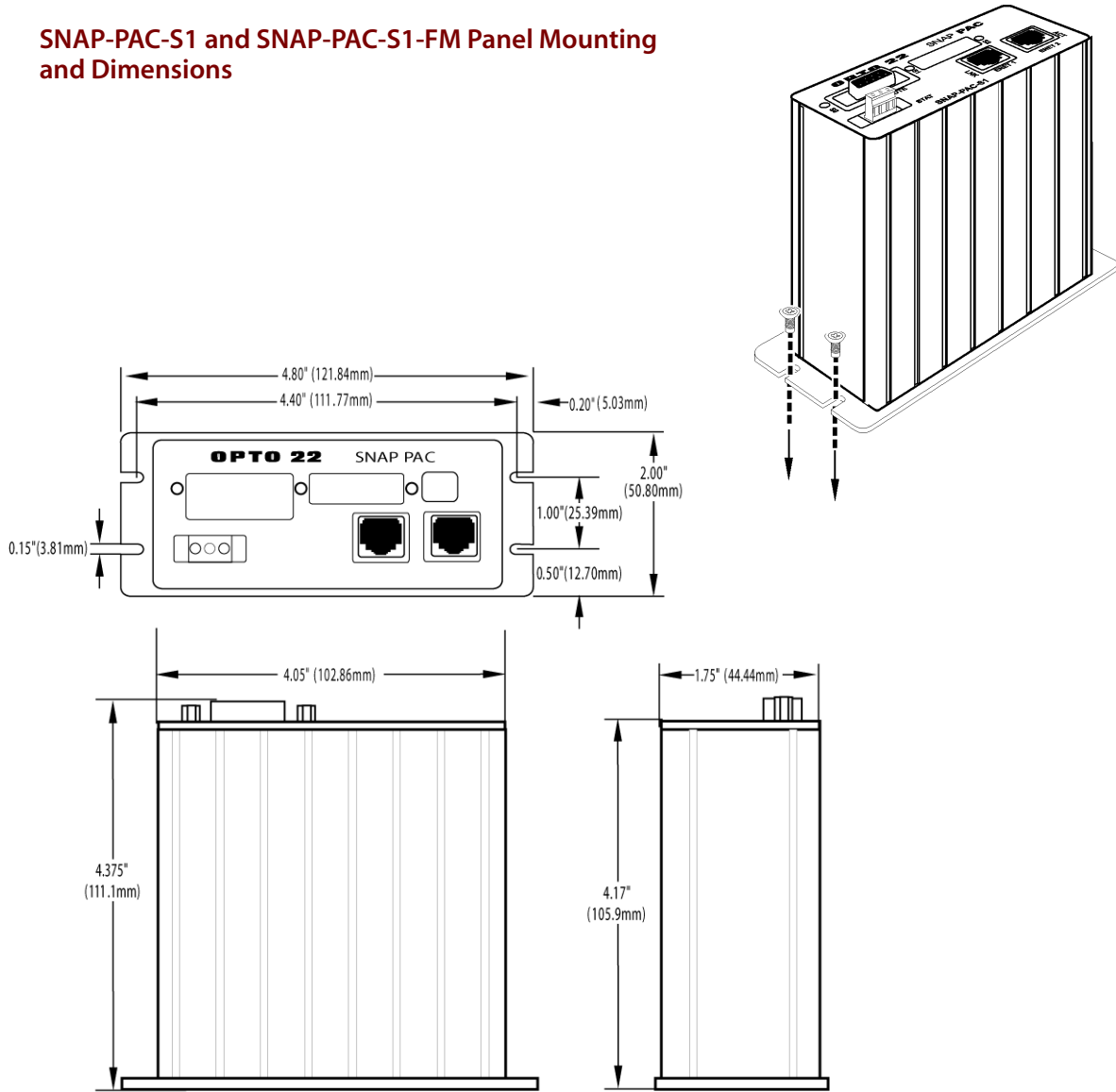
Status and Activity LEDs

Indicator	Description
TX0/RX0	Serial activity on port 0
TX1/RX1	Serial activity on port 1
TX2/RX2	Serial activity on port 2
TX3/RX3	Serial activity on port 3
STAT	Startup status and control program operational status
ACT	Ethernet network activity
LINK	Link established with Ethernet network

SNAP PAC S-Series Controllers

Dimensional Drawings

SNAP-PAC-S1 and SNAP-PAC-S1-FM Panel Mounting and Dimensions

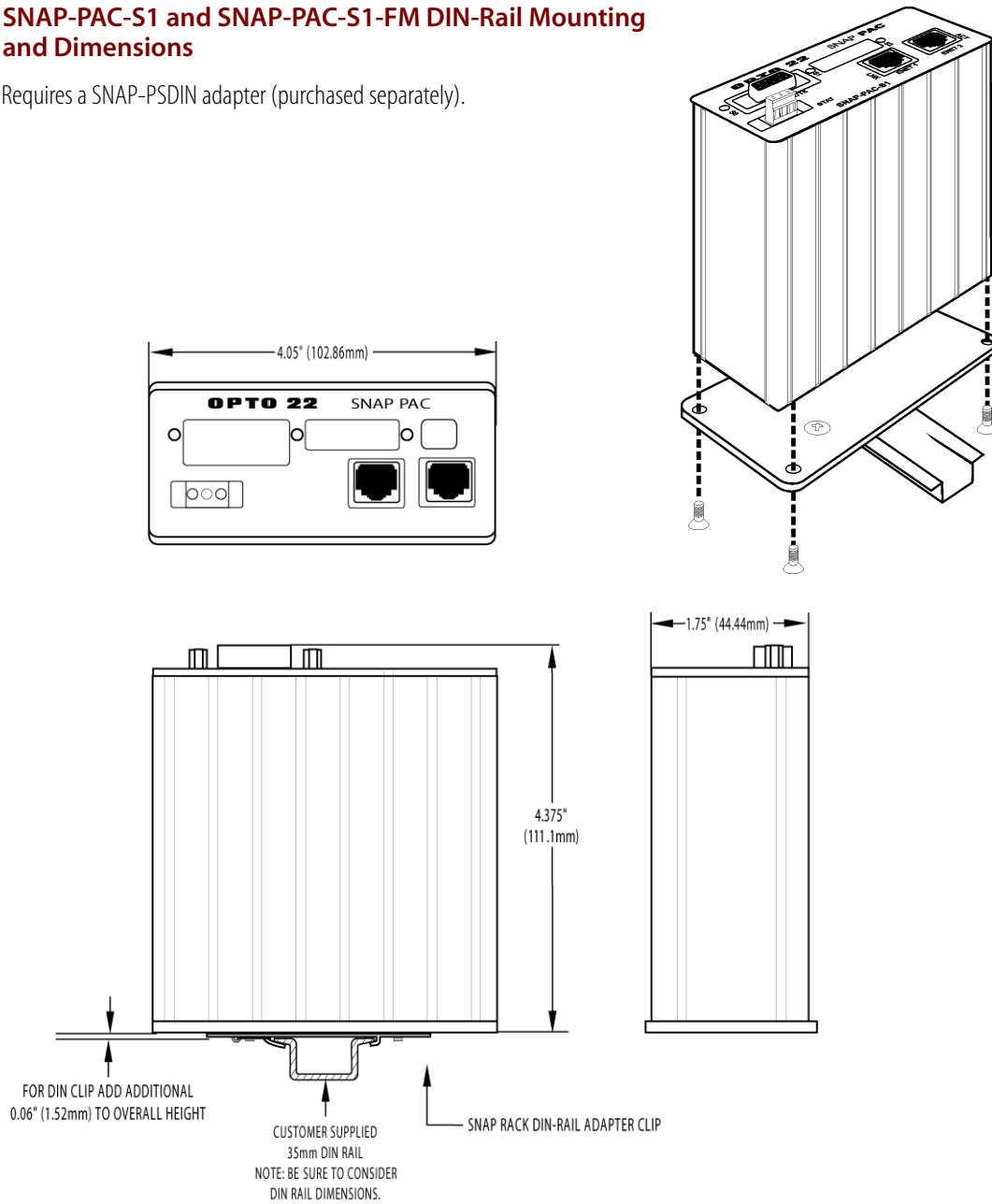


SNAP PAC S-Series Controllers

Dimensional Drawings (continued)

SNAP-PAC-S1 and SNAP-PAC-S1-FM DIN-Rail Mounting and Dimensions

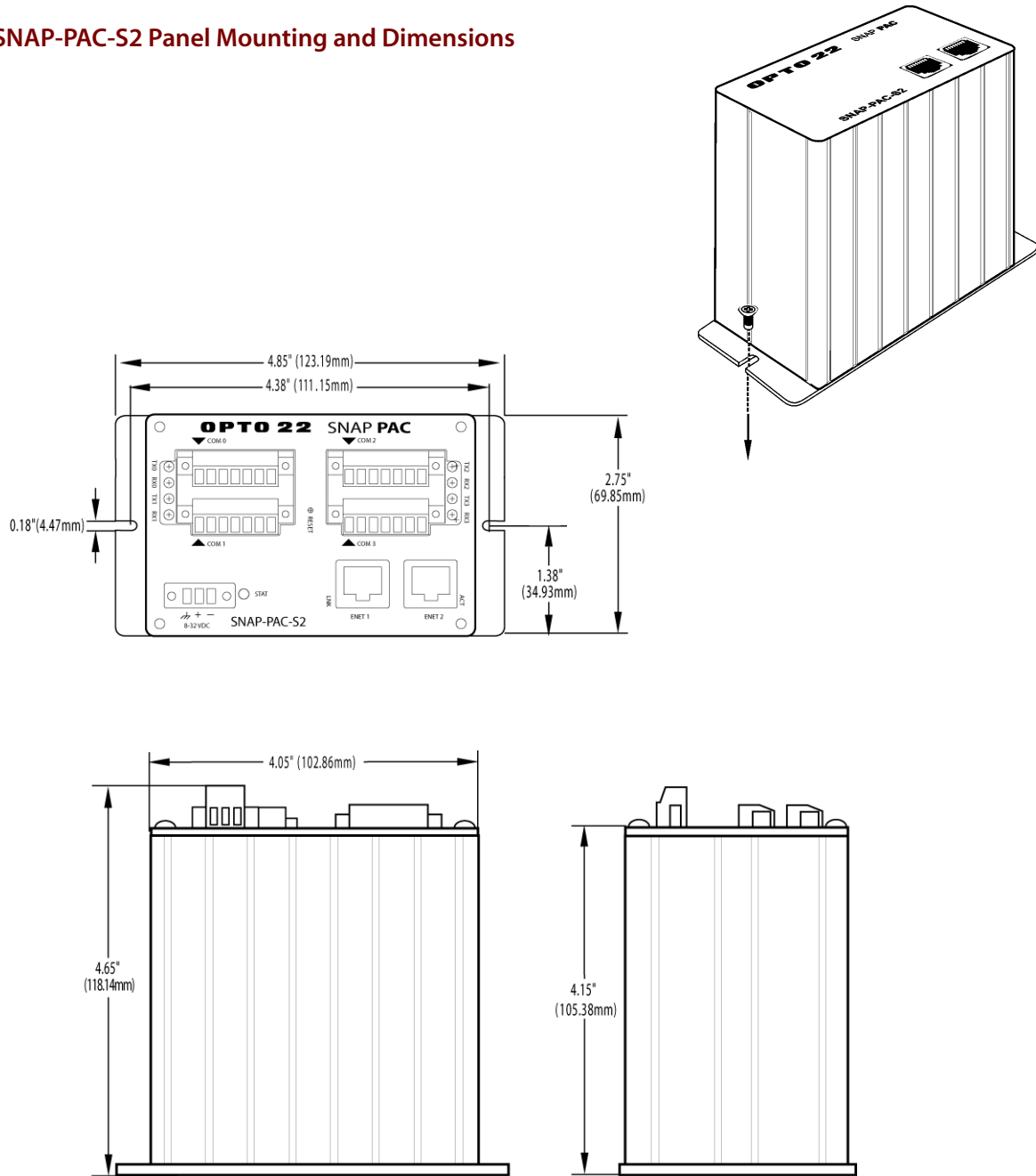
Requires a SNAP-PSDIN adapter (purchased separately).



SNAP PAC S-Series Controllers

Dimensional Drawings (continued)

SNAP-PAC-S2 Panel Mounting and Dimensions

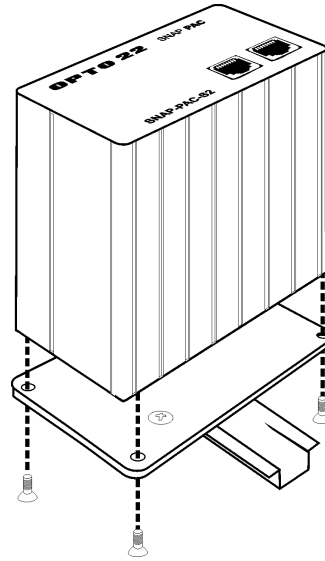
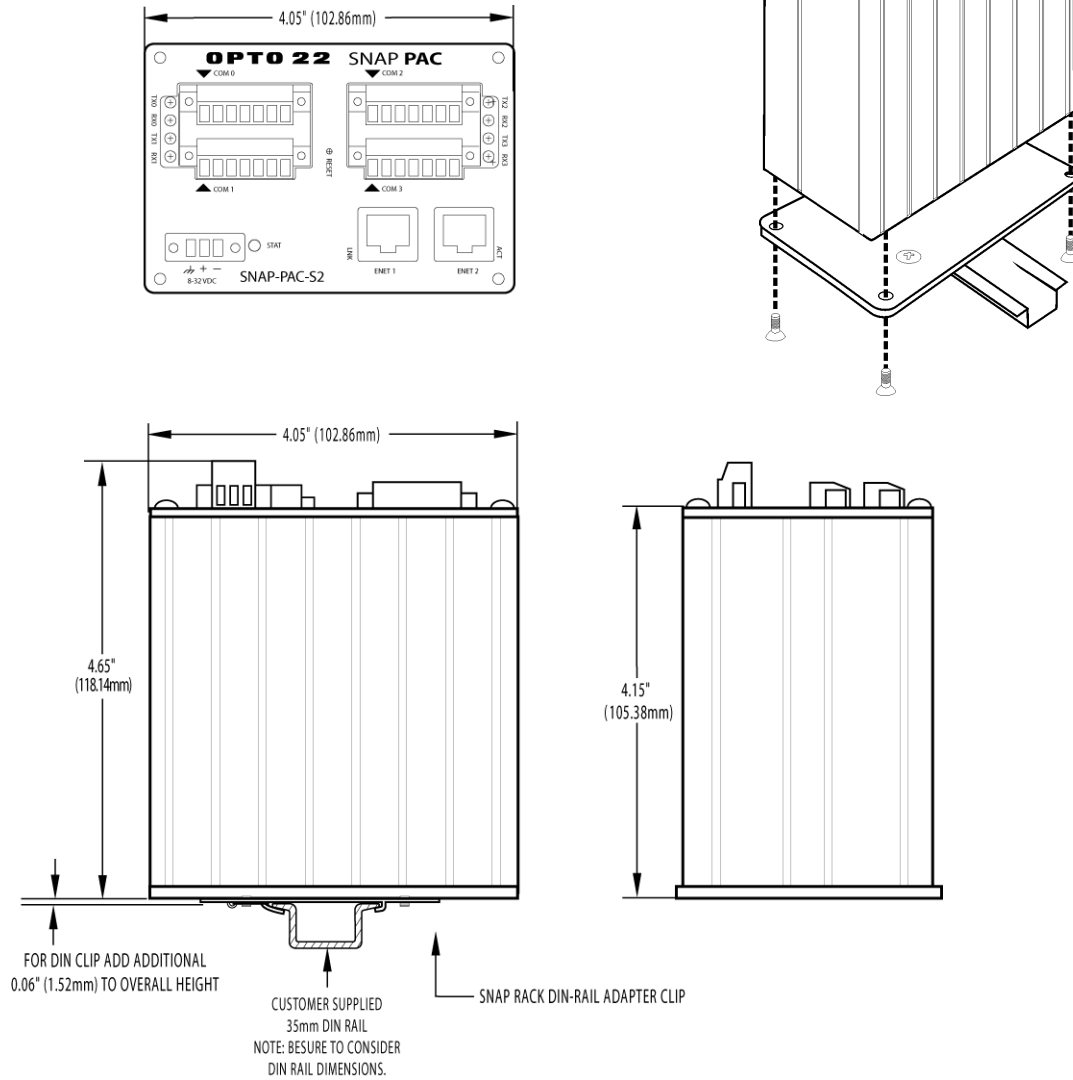


SNAP PAC S-Series Controllers

Dimensional Drawings (continued)

SNAP-PAC-S2 DIN-Rail Mounting and Dimensions

Requires a SNAP-S2DIN adapter (purchased separately).



More About Opto 22

Products

Opto 22 develops and manufactures reliable, flexible, easy-to-use hardware and software products for industrial automation, remote monitoring, and data acquisition applications.

SNAP PAC System

Designed to simplify the typically complex process of understanding, selecting, buying, and applying an automation system, the SNAP PAC System consists of four integrated components:

- SNAP PAC controllers
- PAC Project™ Software Suite
- SNAP PAC brains
- SNAP I/O™

SNAP PAC Controllers

Programmable automation controllers (PACs) are multifunctional, multidomain, modular controllers based on open standards and providing an integrated development environment.

Opto 22 has been manufacturing PACs for many years. The latest models include the standalone SNAP PAC S-series and the rack-mounted SNAP PAC R-series. Both handle a wide range of digital, analog, and serial functions and are equally suited to data collection, remote monitoring, process control, and discrete and hybrid manufacturing.

SNAP PACs are based on open Ethernet and Internet Protocol (IP) standards, so you can build or extend a system without the expense and limitations of proprietary networks and protocols.

PAC Project Software Suite

Opto 22's PAC Project Software Suite provides full-featured and cost-effective control programming, HMI (human machine interface) development and runtime, OPC server, and database connectivity software to power your SNAP PAC System.

These fully integrated software applications share a single tagname database, so the data points you configure in PAC Control™ are immediately available for use in PAC Display™, OptoOPCServer™, and OptoDataLink™. Commands are in plain English; variables and I/O point names are fully descriptive.

PAC Project Basic offers control and HMI tools and is free for download on our website, www.opto22.com. PAC Project Professional, available for separate purchase, adds OptoOPCServer, OptoDataLink, options for Ethernet link redundancy or segmented networking, and support for legacy Opto 22 serial *mistic*™ I/O units.

SNAP PAC Brains

While SNAP PAC controllers provide central control and data distribution, SNAP PAC brains provide distributed intelligence for I/O processing and communications. Brains offer analog, digital, and serial functions, including thermocouple linearization; PID loop control; and optional high-speed digital counting (up to 20 kHz), quadrature counting, TPO, and pulse generation and measurement.

SNAP I/O

I/O provides the local connection to sensors and equipment. Opto 22 SNAP I/O offers 1 to 32 points of reliable I/O per module, depending on the type of module and your needs. Analog, digital, serial, and special-purpose modules are all mixed on the same mounting rack and controlled by the same processor (SNAP PAC brain or rack-mounted controller).

Quality

Founded in 1974 and with over 85 million devices sold, 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 do no statistical testing and each part is tested twice before leaving our factory, we can guarantee most solid-state relays and optically isolated I/O modules for life.

Free Product Support

Opto 22's Product Support Group offers free, comprehensive technical support for Opto 22 products. Our staff of support engineers represents decades of training and experience. Product support is available in English and Spanish, by phone or email, Monday through Friday, 7 a.m. to 5 p.m. PST.

Free Customer Training

Hands-on training classes for the SNAP PAC System are offered at our headquarters in Temecula, California. Each student has his or her own learning station; classes are limited to nine students. Registration for the free training class is on a first-come, first-served basis. See our website, www.opto22.com, for more information or email training@opto22.com.

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 or 951-695-3000, or visit our website at www.opto22.com.

www.opto22.com