

SNAP PAC R-Series Controllers

Features

- Rack-mounted industrial controller with I/O processor included.
- Two independent 10/100 Mbps Ethernet network interfaces
- One RS-232 port with handshaking, suitable for modem communication using PPP
- Full-featured control and HMI software included with purchase

Description

The affordable and compact SNAP PAC R-series programmable automation controllers provide powerful, real-time control and communication to meet your industrial control, monitoring, and data acquisition needs. As part of an Opto 22 input/output (I/O) system, one of these on-the-rack, industrially hardened units can handle multiple tasks involving digital and analog control, serial string handling, communication, and enterprise connectivity.

Used with the included ioProject Basic software suite (or ioProject Professional, purchased separately), the Ethernet-based SNAP PAC R-series controller runs control programs written in Opto 22's ioControl™ software to monitor and control a wide range of devices and equipment at the I/O level, or as a slave to a SNAP PAC S-series controller. SNAP PAC R-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.

Two models of the SNAP PAC R-series controller are available:

- The **SNAP-PAC-R1** controls a mix of SNAP analog, digital (both standard and high-density), and serial modules. Full digital functions are available with a maximum of eight standard digital modules.
- The **SNAP-PAC-R2** also controls a mix of SNAP analog, standard and high-density digital, and serial modules. Digital functions are simplified; up to 16 standard digital modules can be used.

Built-in functions and comparisons of the SNAP-PAC-R1 and SNAP-PAC-R2 are shown in the table on [page 6](#).



**SNAP-PAC-R1
controller**

Ethernet Communication

SNAP PAC R-series 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 R-series controllers include two 10/100 Mbps Ethernet interfaces for networking to Ethernet hosts and to other I/O units. These independent Ethernet ports have separate IP addresses that can be used with ioProject™ 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. For more information on implementing redundant network links with a SNAP PAC controller, see Opto 22's *Redundancy Technical Note* (Opto 22 form 1597).

Serial Communication

SNAP PAC R-series controllers provide an RS-232 serial link to support Point-to-Point Protocol (PPP) modem connections—for creating TCP/IP networks over serial or PSTN (Public Switched

Part Numbers

Part	Description
SNAP-PAC-R1	Analog/digital/serial rack-mounted controller with two Ethernet ports
SNAP-PAC-R2	Analog/simple digital/serial rack-mounted, 64-point controller with two Ethernet ports

Telephone Network) lines—as well as remote serial device communication.

The RS-232 serial interface supports either a modem connection using PPP or general-purpose communication with serial devices, allowing you to send and receive data from a serial device connected directly to the controller. For additional serial interfaces, you can add one or more SNAP serial communication modules on the rack.

I/O Mounting Racks

SNAP PAC R-series controllers must be connected to the appropriate rack to avoid damage to the controller. Both the SNAP-PAC-R1 and R2 are designed to work with M-series mounting racks, which are available with 4, 8, 12, or 16 positions for Opto 22 SNAP I/O modules. This is unlike older rack-mounted Opto 22 controllers, such as the SNAP-UP1-ADS, which used a SNAP B-series mounting rack.

SNAP I/O

Each SNAP standard digital module contains four input or four output points. SNAP high-density digital modules contain 32 input or 32 output points. The SNAP-PAC-R1 supports digital features such as high-speed counting *in positions 0-7* on a SNAP M-series mounting rack. For the SNAP PAC-R2, all 16 slots may be used for digital modules, but only simple digital features are available. See the table on [page 6](#) for specifics.

SNAP analog modules used with a SNAP PAC R-series controller contain either two points or four points, depending on the module. Most SNAP serial communication modules provide two serial ports to connect serial devices to the Ethernet network.

Software

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

- **ioProject Basic** includes ioControl for developing control programs, ioDisplay™ for creating operator interfaces, and ioManager™ configuration software.
- **ioProject Professional** adds expanded versions of ioControl and ioDisplay plus OptoOPCServer™ software for exchanging data with OPC 2.0-compliant client software applications.

ioControl Basic is a graphical, flowchart-based programming tool for machine control and process applications. Using ioControl, you create, download, and run strategies on a SNAP PAC controller. In addition to flowchart programming with subroutine capability, ioControl includes a powerful, built-in scripting language based on

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C and other procedural languages. **ioControl Professional** adds the ability to import legacy OptoControl strategies, support for older *mistic*™ serial I/O units, and support for the dual independent Ethernet ports on a SNAP PAC controller. A SNAP R-series controller simultaneously runs up to 16 ioControl flowcharts, although the ioControl strategy can actually contain a much larger number of flowcharts. The total number of flowcharts is limited only by the memory available for strategy storage.

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

OptoOPCServer™ is a fast, efficient OPC 2.0-compliant server for communicating with many Opto 22 products, including SNAP PAC controllers and other SNAP controllers running ioControl strategies; SNAP Ethernet-based I/O units that use SNAP brains like the SNAP-B3000-ENET or SNAP-ENET-M64; 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++®.

ioManager™ is a utility application for assigning IP addresses to SNAP PAC controllers, reading or changing basic controller configuration, and more. ioManager is also used to configure additional Ethernet I/O units that communicate with the controller.

Software Availability

ioProject Basic is included with SNAP PAC controllers and is a free download from the Opto 22 website. ioProject Professional is available for purchase on a CD with both Acrobat PDF format and printed documentation.

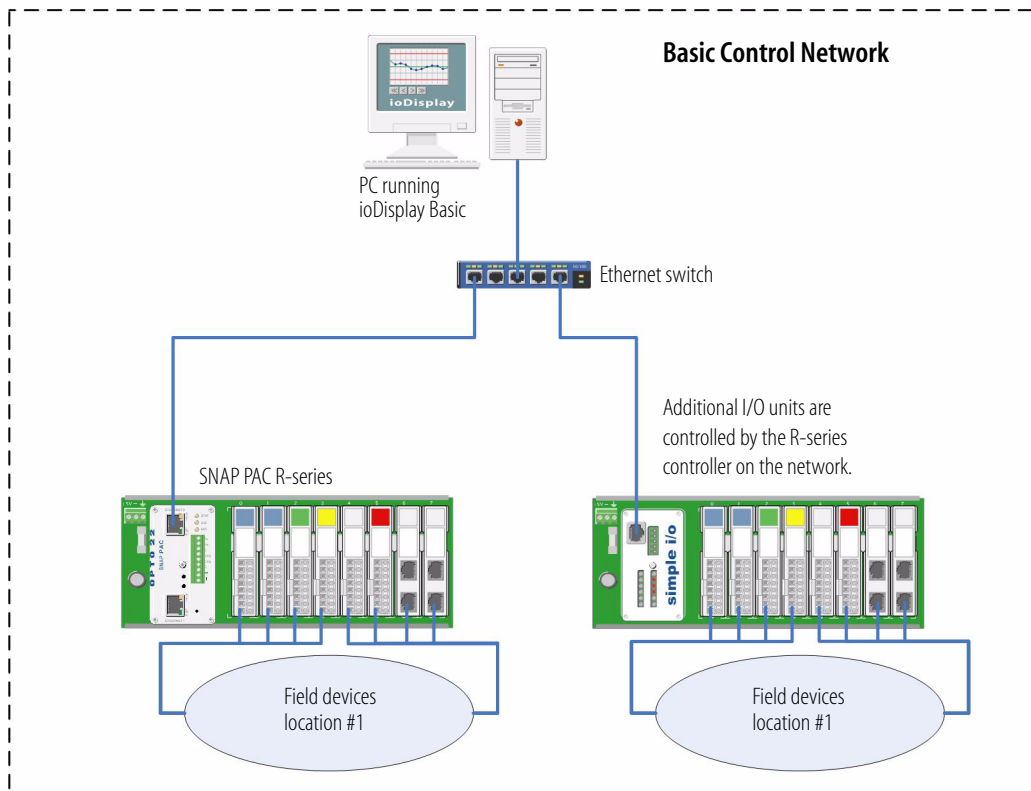
To get ioProject Professional immediately, you can buy and download the software from the Opto 22 website at www.opto22.com; the CD and printed documentation will be shipped to you. You can also separately purchase ioControl Professional, ioDisplay Professional, and OptoOPCServer as needed. For additional information, see the ioProject data sheet, Opto 22 form #1473.

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System Architecture

For the network shown in this diagram, either ioProject Professional or ioProject Basic can be used.

SNAP PAC R-series Controller in Basic Network Configuration



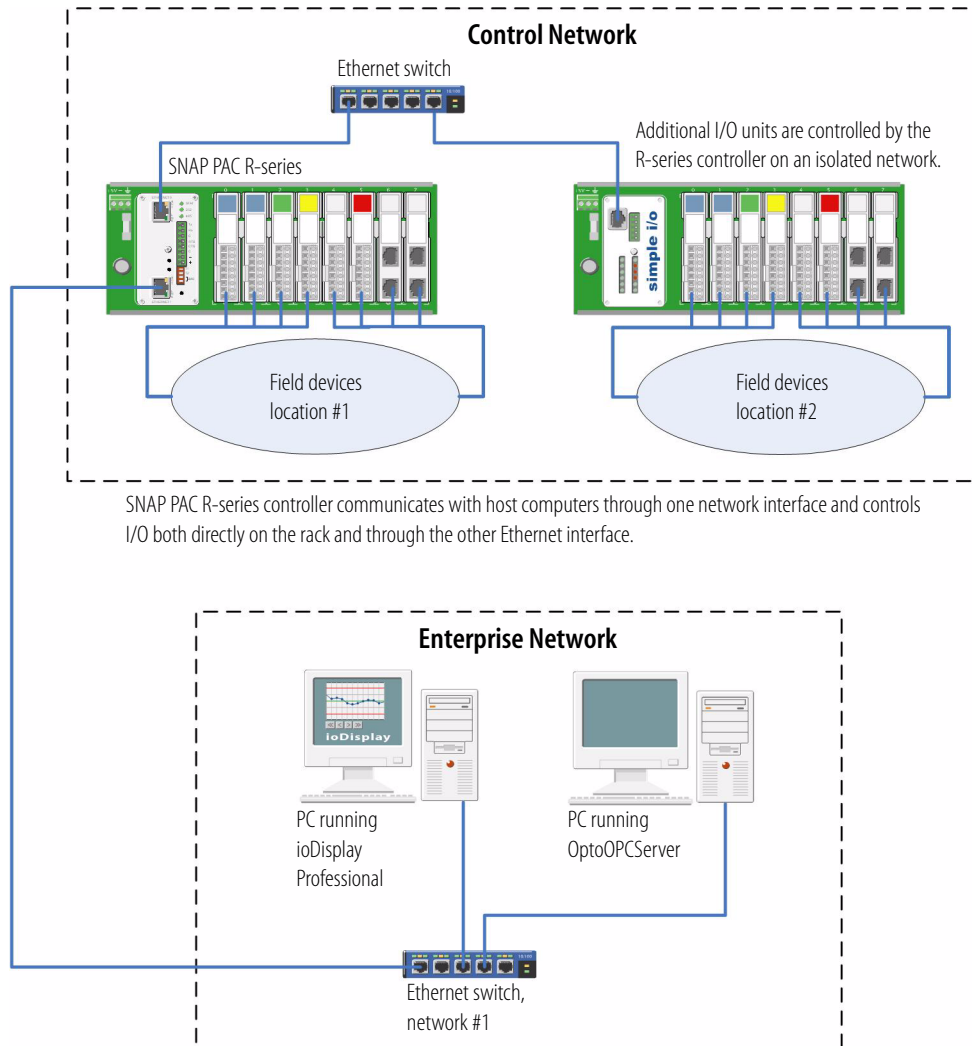
In this diagram, the SNAP PAC R-series controller uses one network interface to communicate with host computers and control I/O. The controller controls I/O on its own rack and on other Ethernet-based I/O units.

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System Architecture (continued)

The network shown in this diagram requires ioControl Professional and ioDisplay Professional.

SNAP PAC R-series Controller Segmenting Ethernet Networks



This diagram shows two Ethernet-based Opto 22 I/O units connected together over an Ethernet network and controlled by a SNAP PAC R-series controller running an ioControl strategy.

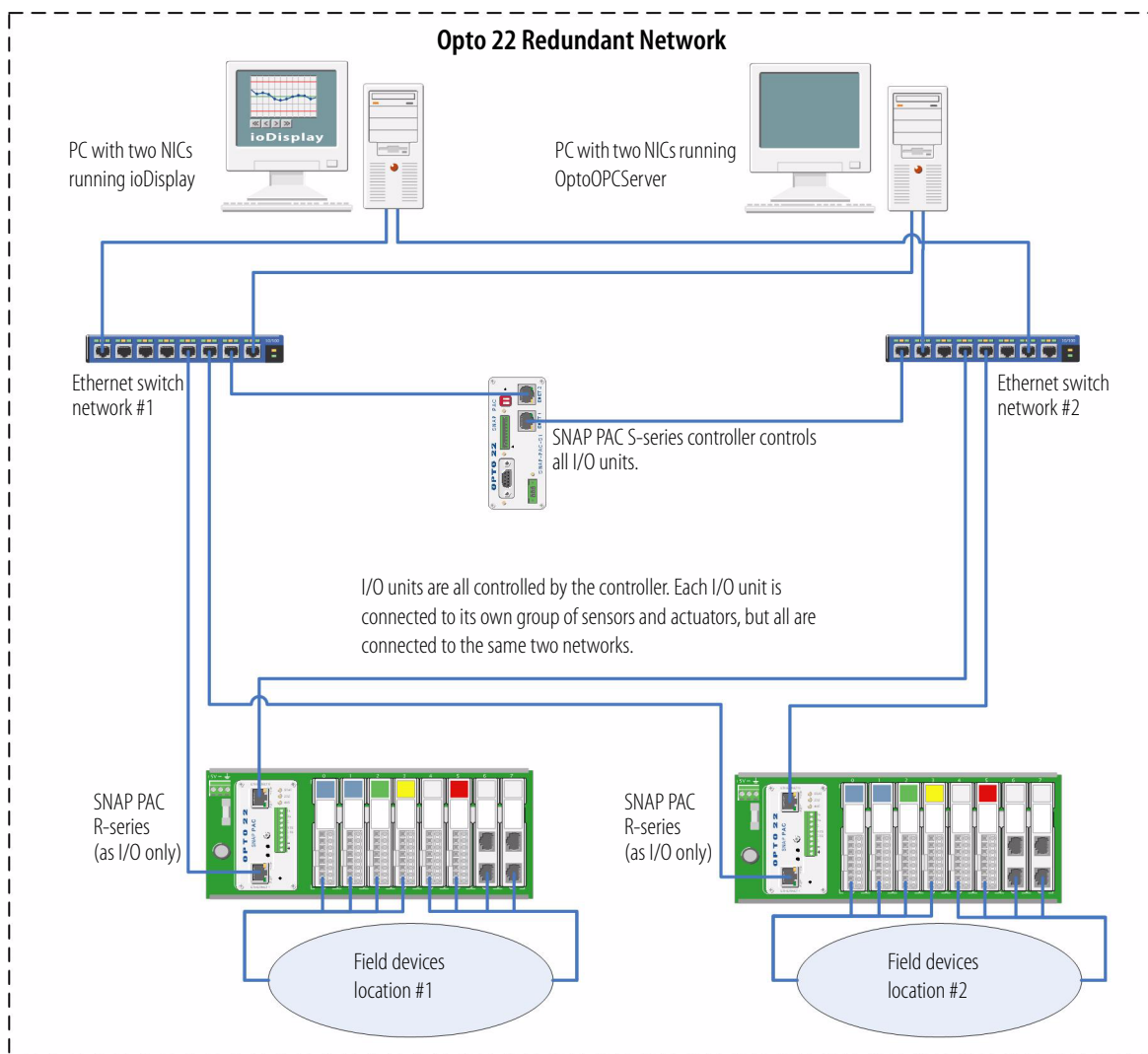
The controller is also connected to a larger, separate enterprise Ethernet network to provide data to PCs running Opto 22's ioDisplay HMI software and OptoOPCServer. Sitting between the two networks, the SNAP PAC R-series controller segments enterprise traffic from the control network.

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System Architecture (continued)

The network shown in this diagram requires ioControl Professional and ioDisplay Professional.

SNAP PAC R-series Controller in Redundant Network Configuration



This diagram shows two SNAP PAC R-Series controllers functioning as I/O unit brains connected to two separate Ethernet networks. This configuration addresses the concern that an Ethernet network may fail or need maintenance, leaving the PC running OptoPCServer, the PC running ioDisplay, the controller, and the I/O units unable to communicate.

In this configuration, if one network goes down, devices can still communicate because the SNAP PAC R-series controllers and the SNAP PAC S-series controllers both have two network interfaces, and each PC in this system has two network interface cards.

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Specifications

Processor	200 MHz 32-bit ColdFire® 5475 with integrated floating-point unit (FPU)
Memory Total RAM Battery-backed RAM Flash	16 MB (4 MB available for ioControl strategy; 2 MB available for file storage) 2 MB 8 MB (3.25 MB available for ioControl strategy; 384 KB available for file storage)
Backup battery	3-volt CR2032 Lithium, user replaceable Typical service life with power off: 5 years
Communication Ethernet (host and I/O) RS-232 serial (host only)	Two independent 10/100 Mbps Ethernet network interfaces (RJ-45 connectors) Each interface has a separate IP address. *One RS-232 serial port with hardware handshaking
I/O unit compatibility	Ethernet-based I/O units: Opto 22 SNAP Simple I/O, SNAP Ethernet I/O, SNAP Ultimate I/O, and SNAP PAC R-series I/O units
Power requirements	5.0–5.2 VDC @ 1.2 A
Environmental Operating temperature Storage temperature Humidity	0 °C to 60 °C -40 °C to 85 °C 0% to 95% relative humidity, non-condensing
Software ioProject Basic ioProject Professional	Includes programming, HMI software, and configuration software; included with purchase of controller. ioProject Basic plus OPC 2.0-compliant OPC server, OptoControl strategy and OptoDisplay project importing, and Ethernet link redundancy or network segmenting support.
Other features	<ul style="list-style-type: none"> • Multiple protocol support including TCP/IP, FTP, Modbus/TCP, SNMP, OptoMMP™, and SMTP • Built-in I/O processor • Real-time clock • FTP server/client with file system • Scratch Pad area for peer-to-peer communication • Configurable link redundancy or segmented networking for I/O-controller subnetting (when using ioProject Professional)

*The serial connector can be used for a modem connection using PPP. This connector can also be used for a direct connection to a serial device; communication is handled through ioControl.

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SNAP PAC R-Series Comparison Chart

The following table compares SNAP-PAC-R1 and SNAP-PAC-R2 controllers.

FEATURE		SNAP-PAC-R1	SNAP-PAC-R2
Digital I/O points	Input latching	●	●
	On/off status	●	●
	Watchdog timer	●	●
	High-speed counters (up to 20 kHz) ²	●	
	Quadrature counters	●	
	On-pulse and off-pulse measurement ^{1,2}	●	
	TPO (time-proportional output) ^{1,2}	●	
	Pulse generation (N pulses, continuous square wave, on-pulse, and off-pulse) ^{1,2}	●	
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 ¹	●	●
High-density digital modules (inputs and outputs)		●	●
Serial communication modules		●	●
Serial events		●	●
PID logic on the brain		32 PIDs	32 PIDs
Digital events		●	●
Alarm events		●	●
Timers		●	●
Event messages		●	●
UDP Streaming		●	●
Email (SMTP client)		●	●
OPC driver		●	●
Data logging in the brain		●	●
Security (IP filtering, port access)		●	●
Realtime clock (RTC)		●	●
I/O point data mirroring		●	●
Memory map copying		●	●
Scratch Pad area—bits, floats, integers, strings		●	●
SNMP (network management of I/O & variables)		●	●

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FEATURE	SNAP-PAC-R1	SNAP-PAC-R2
PPP (dial-up and radio modems)	●	●
FTP server and client	●	●
Modbus/TCP	●	●
OptoMMP memory-mapped protocol	●	●
Ethernet network	●	●
Serial (RS-232)	●	●
Runs ioControl strategies	●	●
ioControl compatibility (using SNAP PAC or SNAP-LGE controller or SNAP Ultimate I/O)	●	●
Mounting rack	SNAP-M racks	SNAP-M racks
Number of modules per mounting rack	4, 8, 12, or 16	4, 8, 12, or 16
Module types and maximum numbers allowed per I/O unit (with largest rack)	8 digital ² 16 analog 8 serial 16 HDD ³	16 digital ² 16 analog 8 serial 16 HDD ³

1 Available when used with ioControl Professional

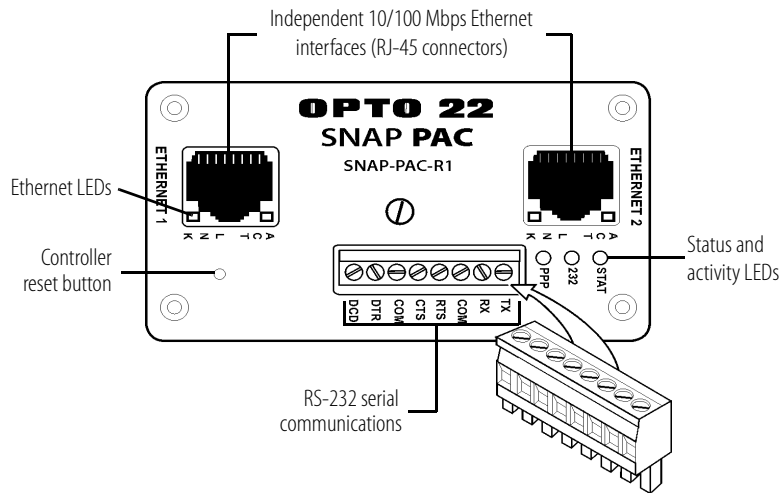
2 Standard digital modules

3 High-density digital modules

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Connectors and Indicators

The following information applies to both SNAP-PAC-R1 and SNAP-PAC-R2 controllers.



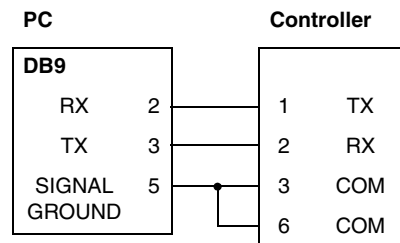
RS-232 Port

Pin	Description
1	TX
2	RX
3	COM
4	RTS
5	CTS
6	COM
7	DTR
8	DCD

Status and Activity LEDs

Indicator	Description
ACT	Ethernet network activity
LNK	Link established with Ethernet network
STAT	Startup status and control program operational status
232	RS-232 serial activity <i>Color Description</i> Green TX Red RX Orange TX/RX (transmitting and receiving simultaneously)
PPP	PPP status

RS-232 Serial Cable Wiring*

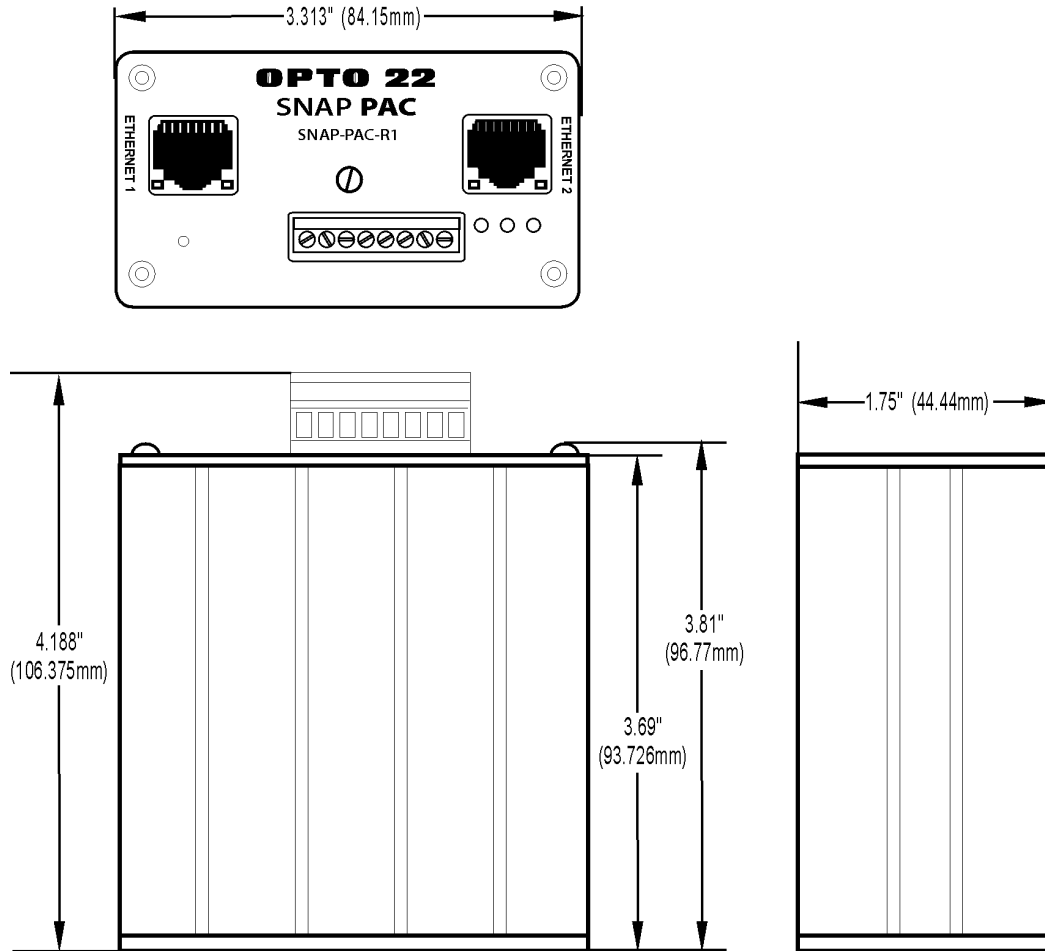


* Minimum requirements for wiring an RS-232 serial cable to connect to a PC. If you want to connect the controller to a modem, see form #1595, the SNAP PAC R-Series Controllers User's Guide, for all eight pin connections.

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Dimensions

The dimensions are the same for the SNAP-PAC-R1 and SNAP-PAC-R2 controllers.



More About Opto 22

Products

Opto 22 develops and manufactures a broad array of reliable, flexible hardware and software products for industrial automation, remote monitoring, data acquisition, and machine-to-machine (M2M) applications.

SNAP PACs (Programmable Automation Controllers)

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

ioProject Software Suite

Opto 22's ioProject Software Suite provides full-featured and cost effective control, HMI (human machine interface), and OPC software to power your Opto 22 hardware.

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

ioProject Basic offers control and HMI tools and is included in your purchase of a SNAP PAC controller. ioProject Professional, available for separate purchase, adds OptoOPCServer, options for Ethernet link redundancy or segmented networking, and support for legacy Opto 22 mistic™ I/O units.

SNAP Ethernet I/O

Based on worldwide standards Ethernet and Internet Protocol (IP), SNAP Ethernet I/O systems offer flexibility in their network

connectivity and in the software applications they work with, including:

- Opto 22's own ioProject suite of control, HMI, and OPC software
- Modbus®/TCP software and hardware
- Third-party HMIs and other OPC client software
- Database, email, network management, and other enterprise systems
- Custom applications developed with the free OptoMMP Driver Toolkit

SNAP Ethernet I/O also works with SNAP PACs to build a complete automation system: PACs provide central control and data distribution; SNAP Ethernet I/O provides local connection to sensors and equipment and includes distributed intelligence for local control, counting, latching, thermocouple linearization, PID loop control, and more.

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 SNAP PACs, ioProject software, and SNAP Ethernet I/O 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 training.opto22.com for more information.

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 visit the website at www.opto22.com.

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