OPTO 22

DATA SHEET

Form 1264-090519

Part Number	Description
SNAP-PID-V	Setpoint and process inputs 0–10 VDC, PID outputs 4–20 mA and 0–10 VDC

Description

The SNAP-PID-V module is designed for users of Opto 22 SNAP Ethernet I/O™ systems with SNAP Ethernet and SNAP wireless LAN brains. The SNAP-PID-V monitors input signals and adjusts output signals to control one proportional-integral-derivative (PID) loop, performing all necessary PID calculations in the module itself.

Before the introduction of the SNAP-PID-V module, using a PID loop with SNAP Ethernet I/O systems required an Opto 22 industrial controller running an OptoControl™ strategy or a remote computer running SCADA software. For non-Ethernet I/O units, the multifunction B3000 brain could be used. The SNAP-PID-V module makes this equipment unnecessary, since all PID calculations are made in the module independent of a controller or other processor.

NOTE: The SNAP-PID-V module cannot be used in a SNAP PAC IO4AB system. However, PID functionality is available on all SNAP-PAC brains that support IO4AB.

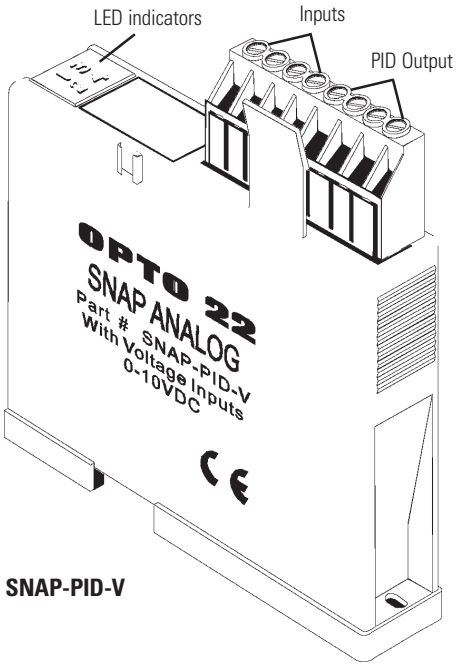
Applications

Typical applications for the SNAP-PID-V module include temperature, pressure level, flow, and process control. The SNAP-PID-V is ideal for remote installations or other environments where communication links are subject to interruption. Since PID calculations run locally on the I/O module, PID loop control can continue independently if the communication link to the I/O system is broken.

The SNAP PID module is also useful in applications where multiple PID loops must be controlled at one location. When multiple PID loop calculations run on an industrial controller or computer, a performance slowdown occurs. When additional SNAP-PID-V modules are added to a SNAP rack, however, all modules continue to perform PID loop calculations at a constant speed without system degradation, providing a highly scalable solution. Up to twelve SNAP-PID-V modules can be used on an Opto 22 16-module B-series mounting rack.

Inputs and Outputs

The SNAP-PID-V can use 0–10 VDC analog inputs for PID setpoint and process variables. Analog inputs share a common reference and are not isolated from each other. PID output, sharing a common negative terminal, provides 4–20 mA current and 0–10 VDC voltage outputs. (The PID output value is calculated by the module and then sent simultaneously to both 4–20 mA and 0–10



SNAP-PID-V

Features

- Current and voltage PID output (analog or TPO)
- Setpoint and process variables from analog inputs or from host
- Transformer and optically isolated analog/digital and digital/analog conversion
- Works with OptoControl industrial automation software
- Works with SNAP Ethernet and SNAP wireless LAN brains
- Up to twelve PID modules per rack
- Configure using included OptoENET PID Module Tuner software
- 30-month warranty.

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Description (continued)

VDC outputs as a percent of output scale.) Additionally, PID output can be configured for analog or TPO signals.

The standard SNAP removable top-mounted connector allows easy wiring of inputs and outputs. LED indicators are provided to show PID calculation mode status (manual or auto) and PID output signal status (analog or TPO).

Software Support

PID loop tuning and module configuration can be performed using OptoENET PID Module Tuner software, which is available free of charge on the Opto 22 Web site. This software plots PID values against time to provide visual feedback when tuning PID loops. The SNAP-PID-V can also be accessed using OptoControl, a development tool for industrial automation programming that is part of Opto 22's FactoryFloor suite of industrial automation software.

For details on using the SNAP-PID-V module, see Opto 22 form #1263, the *SNAP PID Module User's Guide*.

Specifications

PID

Scan time range (programmable)	100 ms to 1.8 hrs. (default = 10 sec.)
Proportional range (gain)	0.000 to 255.996 (default = 1.000)
Integral range	0.000 to 255.996 (default = 4.000)
Derivative range	0.0000 to 0.9999 (default = 0.000)
PID output Resolution Deadband range High/Low limits	 12 bits 0 to 100% (default = 0%) Low = 0 VDC or 4 mA (default = 0%) High = 10 VDC or 20 mA (default = 100%)
Max. PID output step change	0 to 100% (default = 100%)
Analog PID outputs	0 to 10 VDC, 4 to 20 mA
TPO PID output Resolution Period range On/Off levels	 8 bits 2.56 sec. to 10.9 min. 0/10 VDC, 4/20 mA

Module and Power Requirements

Isolation (inputs to analog outputs)	250 V_{RMS}
Logic supply voltage	5.0 VDC
Logic supply current	250 mA DC
Max. number of modules per rack	12
Brain compatibility	SNAP-B3000-ENET, SNAP-ENET-RTC, and SNAP-WLAN-FH-ADS
Operating temperature Storage temperature	0° to 70° C -30° to 85° C

Specifications (continued)

Voltage Output

Range	0 to 10 VDC
Span	10 VDC
Resolution	2.44 mV
Response time (% of span / ΔV / Δtime)	99.9% / 19.98 V / 3 ms
Load current	±5 mA min.
Short circuit output (current)	40 mA
Accuracy	0.1% of span
Gain temperature coefficient	50 ppm / ° C
Offset temperature coefficient	20 ppm / ° C

Current Output

Range	4 to 20 mA
Span	16 mA
Resolution	3.9 µA
Output at powerup	4 mA (before initialization)
Response time (% of span / ΔmA / Δtime)	99.9% / 15.98 mA / 3 ms
Accuracy	0.1% of span
Gain temperature coefficient	50 ppm / ° C
Offset temperature coefficient	20 ppm / ° C
Loop voltage (with 250 Ω loop resistance)	8 VDC min. to 32 VDC max.
Formula for max. loop resistance	Loop resistance = (loop voltage – 3) / .02
Max. loop resistance vs. loop supply	250 Ω @ 8 VDC min. 450 Ω @ 12 VDC 600 Ω @ 15 VDC 1050 Ω @ 24 VDC 1450 Ω @ 32 VDC max.

Specifications (continued)

Setpoint/Process Variable Inputs

Range	0 to 10.000 VDC
Overrange	0 to 11 VDC
Resolution	400 µV
Data freshness (max.)	126.2 ms (63.1 ms per channel)
DSP notch filter	10 Hz (–3 dB = 32 Hz)
Input filtering (analog front end)	T.C. = 2.5 ms –3 dB @ 64 Hz
DC common mode rejection	> –120 dB
AC common mode rejection	> –120 dB @ 60 Hz
Max. survivable input	220 VAC/VDC
Max. operating common mode voltage (field terminal to logic connector)	250 VAC/VDC
Accuracy (% full scale)	0.05%
Drift Gain temperature coefficient Offset temperature coefficient	 30 ppm / ° C 15 ppm / ° C
Input resistance (single-ended)	1 MΩ (each channel) (both inputs share the same reference point)

PID Velocity Algorithm Used

Change in output = Gain × (A + B – C)

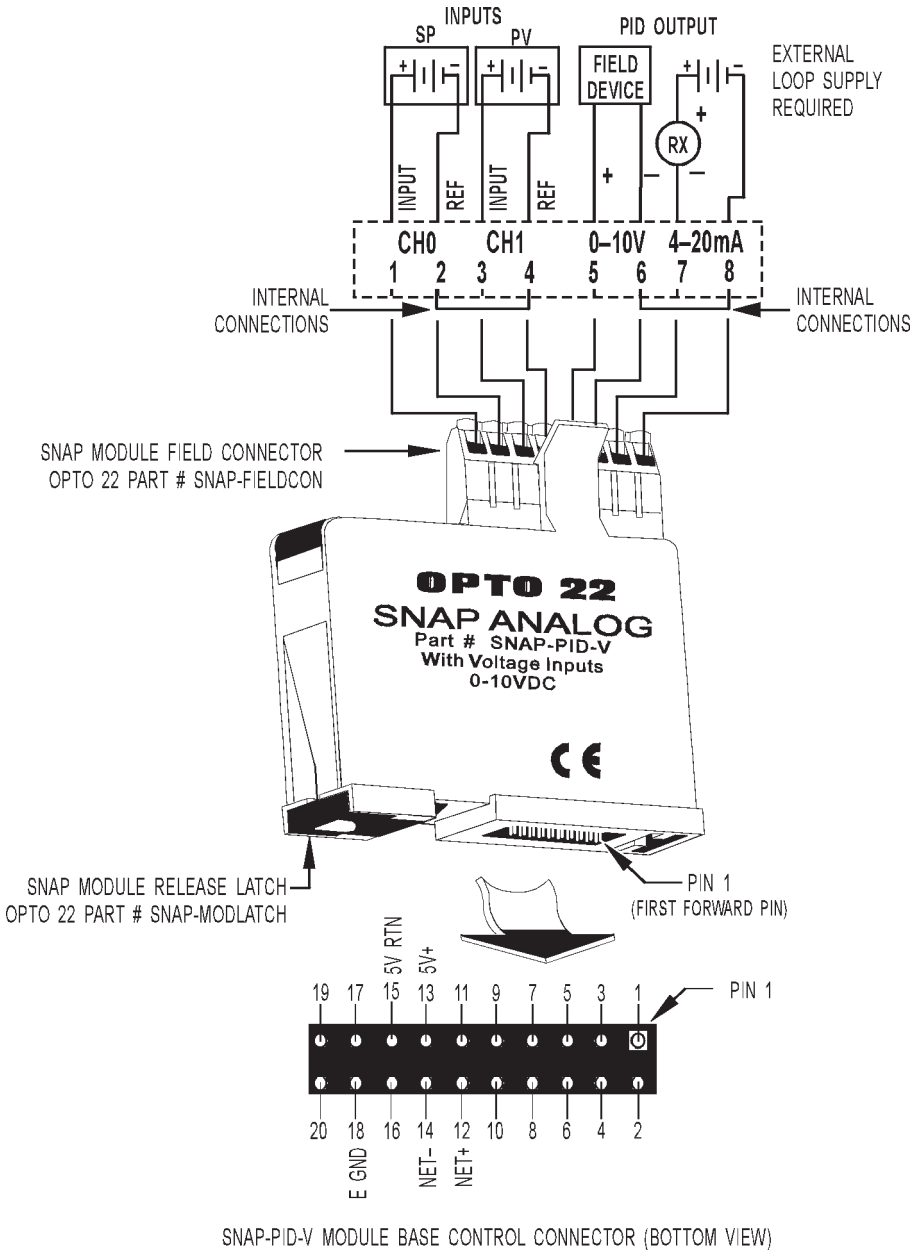
where A = (Error at t_0) – (Error at t_1)
B = ((Error at t_0) / Integral ratio)
C = (Derivative ratio × (PV input at t_0) – (2 × PV input at t_1) + (PV input at t_2))

and Error = Setpoint – PV
t = Scan time (the time between setpoint and process variable readings)
t_0 = Time when the scan timer reaches zero. This is when PID is calculated.
t_1 = The last time the scan timer reached zero, or (t_0 – t).
t_2 = The second-to-last time the scan timer reached zero, or (t_0 – (2 × t)).

PV = Process Variable (the input signal)
Setpoint and process variable readings are taken when the scan timer reaches zero and the PID calculation is made.
Integral ratio = Integral / Scan time
Derivative ratio = Derivative / Scan time

Wiring

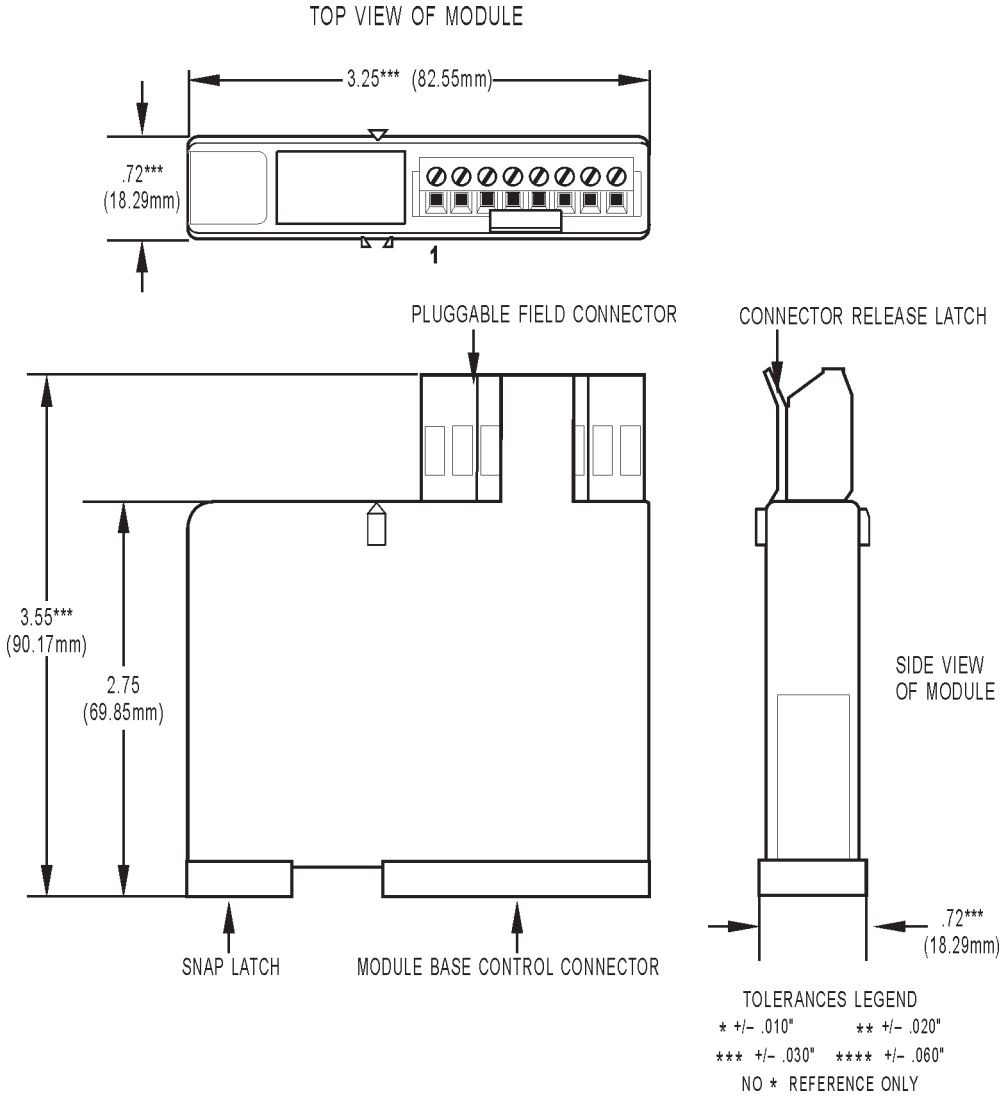
SNAP-PID-V Module



SNAP-PID-V MODULE BASE CONTROL CONNECTOR (BOTTOM VIEW)

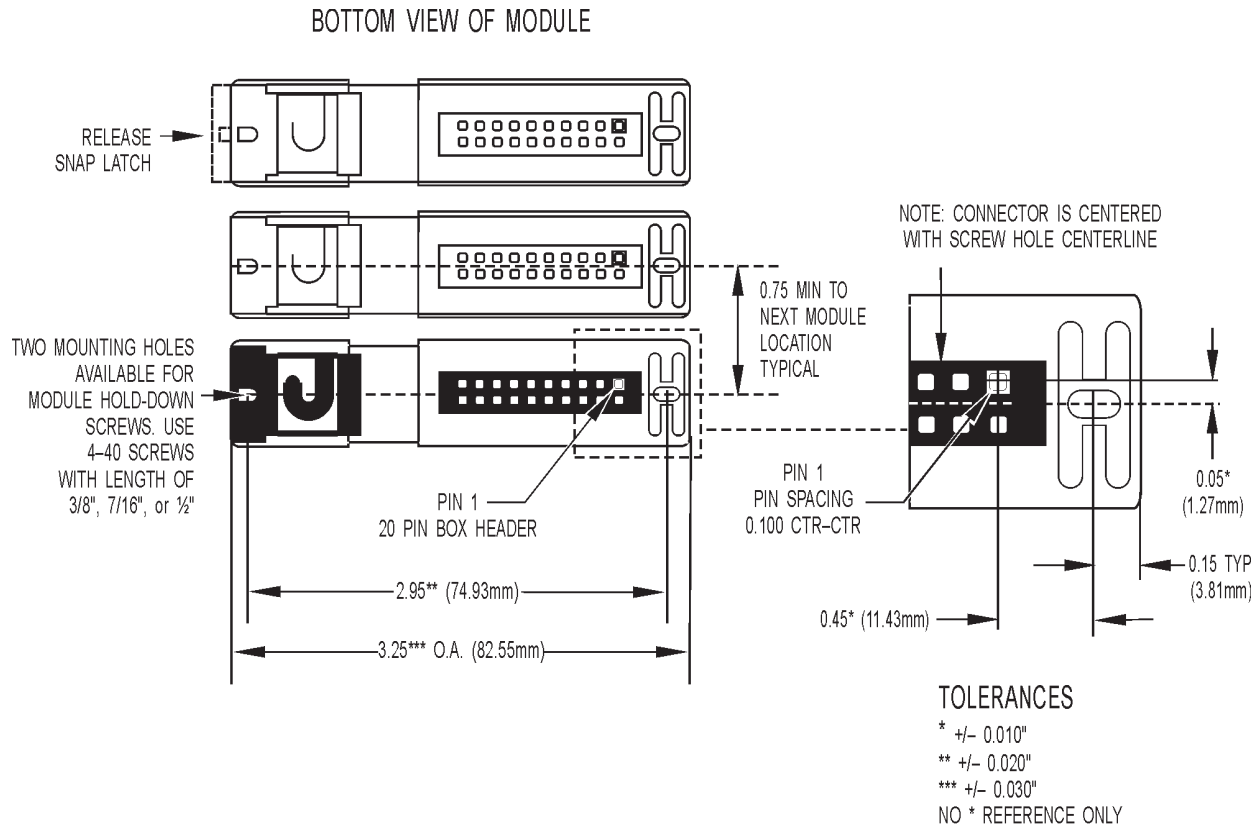
Dimensions

SNAP-PID-V Module



Dimensions (continued)

SNAP-PID-V Module



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.

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