SNAP HIGH-DENSITY DIGITAL MODULE USER'S GUIDE

SNAP-IAC-16

SNAP-IAC-A-16

SNAP-IAC-K-16

SNAP-IDC-16

SNAP-IDC-HT-16

SNAP-IDC-32

SNAP-IDC-32-FM

SNAP-IDC-32N

SNAP-ODC-32-SRC

SNAP-ODC-32-SRC-FM

SNAP-ODC-32-SNK

SNAP-ODC-32-SNK-FM

SNAP HIGH–DENSITY
DIGITAL MODULE USER'S GUIDE

SNAP-IAC-16	SNAP-IDC-32N
SNAP-IAC-A-16	SNAP-IDC-32D
SNAP-IAC-K-16	SNAP-IDC-32DN
SNAP-IDC-16	SNAP-ODC-32-SRC
SNAP-IDC-HT-16	SNAP-ODC-32-SRC-FM
SNAP-IDC-32	SNAP-ODC-32-SNK
SNAP-IDC-32-FM	SNAP-ODC-32-SNK-FM

Form 1547-190604—June 2019

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1: Installation and Testing

INTRODUCTION

SNAP high-density digital modules from Opto 22 provide 16 or 32 points (channels) on one compact SNAP input or output module.

These modules are ideal for OEMs and others who have applications with high point counts, or for any application requiring a large number of digital points on one SNAP I/O rack.

Several high-density digital modules are available:

- **SNAP-IDC-32** and **SNAP-IDC-32-FM** digital input modules, with 32 input points, can be used to sense on/off status for 10–32 VDC inputs from sources such as proximity switches, limit switches, push buttons, and pilot switches (PNP or sourcing type).

- The **SNAP-IDC-32N** is similar, but its input range is -10 to -32 VDC and its common connections are positive rather than negative, making it ideal for NPN or sinking type inputs.

- The **SNAP-IDC-32D** has an input range of 2.5 to 12 VDC.

- The **SNAP-IDC-32DN** offers a -2.5 to -12 VDC input range and has positive common connections, also suited to NPN (sinking) inputs.

- The **SNAP-IDC-16** digital input module offers 16 points with channel-to-channel isolation. It can sense on/off status for 10–32 VDC/VAC loads.

- The **SNAP-IDC-HT-16** leakage tolerant digital input module is used with proximity switches. It offers channel-to-channel isolation for 16 points and senses on/off status for loads of 15–28 VDC/VAC.

- **SNAP-IAC-16**, **SNAP-IAC-A-16**, and **SNAP-IAC-K-16** digital input modules each have 16 points with channel-to-channel isolation. These modules sense on/off status for 90–140 VAC (SNAP-IAC-16), 180–280 VAC (SNAP-IAC-A-16), or 70–130 VAC (SNAP-IAC-K-16).

SNAP-IDC-16

SNAP-ODC-32-SNK

- **SNAP-ODC-32-SRC**, **SNAP-ODC-32-SRC-FM**, **SNAP-ODC-32-SNK**, and **SNAP-ODC-32-SNK-FM** digital output modules have 32 points and can switch on and off 5–60 VDC loads, either sourcing or sinking.

Module part numbers ending in -FM are Factory Mutual approved.

Hardware Compatibility

SNAP high-density digital (HDD) modules are part of the SNAP PAC System. They are designed to mount on a SNAP PAC rack with a SNAP PAC brain or R-series controller (either a standard wired controller or a Wired+Wireless™ model). Analog, serial, and 4-channel digital modules can be mounted on the same rack to provide the mix of signals and density needed at any distributed location.

(For information on using HDD modules with older processors or racks, see "Notes on Legacy Hardware and Software" on page 15.)

Interface Terminal for HDD Modules

The optional **OptoTerminal-G20** operator interface terminal (available separately) is recommended for commissioning and troubleshooting. It plugs into a connector on the top of the module. The OptoTerminal-G20 displays the status of a high-density digital module's points on a two-line LCD display and can also be used to turn output points on and off.

For Help

If you have problems and cannot find the help you need in this guide or on our website, contact Opto 22 Product Support.

Phone:	800-TEK-OPTO (800-835-6786 toll-free in the U.S. and Canada) 951-695-3080 Monday through Friday, 7 a.m. to 5 p.m. Pacific Time	*NOTE: Email messages and phone calls to Opto 22 Product Support are grouped together and answered in the order received.*
Fax:	951-695-3017	
Email:	support@opto22.com	
Opto 22 website:	www.opto22.com	

When calling for technical support, you can help us help you *faster* if you provide the following information to the Product Support engineer:

- A screen capture of the Help > About dialog box showing software product and version (available by clicking Help > About in the application's menu bar).
- Opto 22 hardware part numbers or models that you're working with.
- Firmware version (available in PAC Manager by clicking Tools > Inspect).
- Specific error messages you saw.
- Version of your computer's operating system.

INSTALLING MODULES

As shown below, high-density digital (HDD) modules can be mixed with other modules and placed in any position on a SNAP PAC rack. (For information on using HDD modules with other Opto 22 mounting racks, see "Notes on Legacy Hardware and Software" on page 15.)

SNAP high-density digital modules can be mixed on the rack with SNAP 4-channel digital, analog, and serial modules.
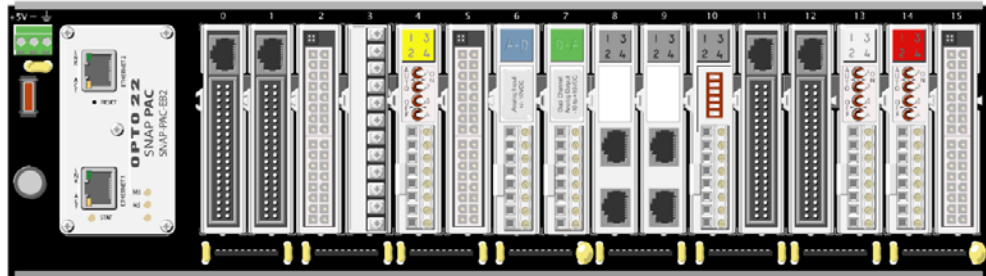
Follow these steps to install modules.

1. Turn off power to the rack.
2. Remove the module from its packaging.
3. Position the module over the connector on the rack, aligning the small slot at the base of the module with the retention bar on the rack. If it is next to another module, make sure the male and female module keys are aligned, as shown at right.
4. Push straight down on the module to snap it into position.

   The module snaps securely into place and requires a special tool (provided) to remove it. To remove a module, see below.
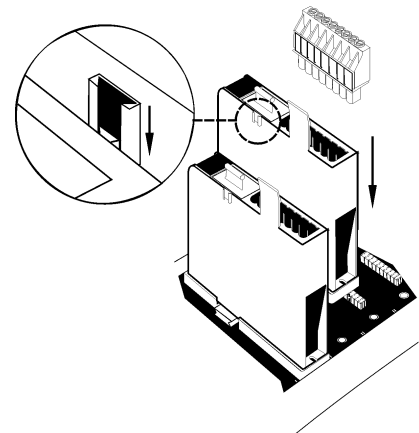
5. As shown at right, use standard 4-40 x 1/4 truss-head Phillips hold-down screws to secure both sides of each module.

   CAUTION: *Do not over-tighten screws. Recommended torque: 4 in-lb (0.45 N-m)*

6. Continue with "Attaching the Cable" on page 7.
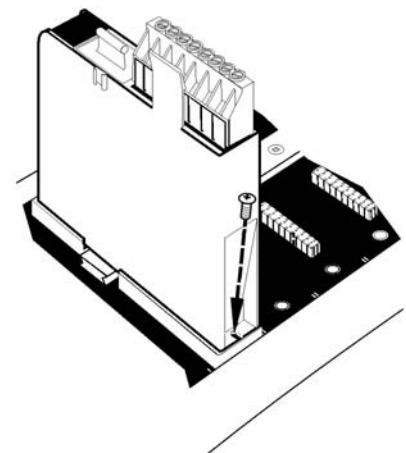
Removing Modules

1. Remove the module's hold-down screws.
2. As shown in the illustration, insert the SNAP module tool (provided) into the notch at the base of the module.
3. Squeeze the module tool against the module to open the release latch, and pull straight up on the module to remove it.
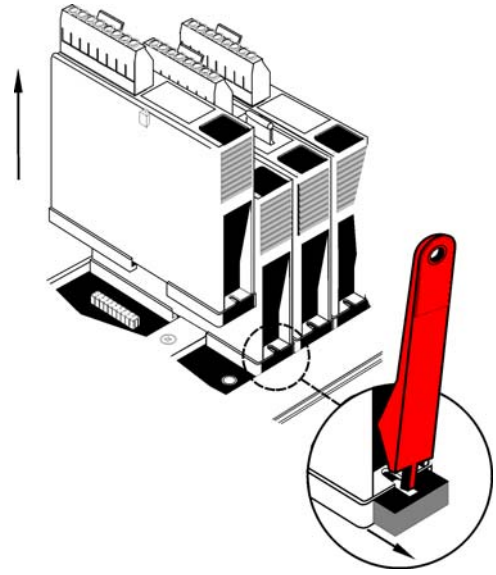
WIRING THE MODULE

Cables and breakout boards are available separately to make field wiring easier.

- Cables plug into the wiring connector(s) on the top of the module and have flying leads or end connectors that can go directly to field devices or connect through breakout boards or a barrier strip. Each cable is 6 feet (1.8 m) long.
- Breakout boards can provide fusing, convenience, and even the ability to manage higher current loads through G4 digital I/O or mechanical relays.

Specifications and wiring for cables and breakout boards are in Opto 22 form 1756, *SNAP TEX Cables and Breakout Boards Data Sheet*, available on our website at www.opto22.com.

The table on the following page shows the available options for wiring field devices to HDD modules. Look in the left column for the module you have. Breakout boards for the module are listed in the column headings. Compatible cables are shown in the center table cells. The last column shows the appropriate cable if you are not using a breakout board.

Module	Breakout Board							Without a breakout board
	SNAP-TEX-32	SNAP-TEX-FB16-H SNAP-TEX-FB16-L	SNAP-TEX-MR10-4 SNAP-TEX-MR10-16 SNAP-TEX-MR10-16C	SNAP-IDC-HDB SNAP-IDC-HDB-FM	SNAP-ODC-HDB SNAP-ODC-HDB-FM	SNAP-UDC-HDB	SNAP-UDC-HDB-G4	
SNAP-IAC-16 SNAP-IAC-A-16 SNAP-IAC-K-16 SNAP-IDC-16 SNAP-IDC-HT-16	SNAP-HD-ACF6 (2 modules/ board)	SNAP-HD-ACF6	Not used with inputs	Not used	Not used	Not used	Not used	SNAP-HD-ACF6
SNAP-IDC-32 SNAP-IDC-32-FM SNAP-IDC-32D SNAP-IDC-32N SNAP-IDC-32DN	SNAP-HD-CBF6	SNAP-HD-CBF6 (2 boards/ module)	Not used with inputs	SNAP-HD-BF6	Not used	SNAP-HD-BF6	Not used / SNAP-HD-BF6	SNAP-HD-CBF6
SNAP-ODC-32-SNK SNAP-ODC-32-SNK-FM SNAP-ODC-32-SRC SNAP-ODC-32-SRC-FM	SNAP-HD-CBF6	SNAP-HD-CBF6 (2 boards/ module)	Do not use / SNAP-HD-CBF6 SNAP-HD-G4F6 (MR10-16C only)	Not used / Not used	SNAP-HD-BF6	SNAP-HD-BF6	SNAP-HD-BF6 / Not used	SNAP-HD-CBF6

Choosing Breakout Boards

The following tables compare breakout board main features to help you choose the one you need. See form 1756, *SNAP TEX Cables and Breakout Boards Data Sheet*, for complete information on all breakout racks used with HDD modules.

For 16-point HDD modules:

Board	Features	Used with
SNAP-TEX-FB16-H	Fusing Fuse-blown indicators Bussed power, 120–240 V	SNAP-IAC-16 SNAP-IAC-A-16 SNAP-IAC-K-16 SNAP-IDC-16 SNAP-IDC-HT-16
SNAP-TEX-FB16-L	Fusing Fuse-blown indicators Bussed power, 12–24 V	SNAP-IAC-16 SNAP-IAC-A-16 SNAP-IAC-K-16 SNAP-IDC-16 SNAP-IDC-HT-16
SNAP-TEX-32	Straight-through wiring Use 2 modules per board.	SNAP-IAC-16 SNAP-IAC-A-16 SNAP-IAC-K-16 SNAP-IDC-16 SNAP-IDC-HT-16

For 32-point HDD input modules:

Board	Features	Used with
SNAP-IDC-HDB	Fusing LED for each input point	SNAP-IDC-32 SNAP-IDC-32N SNAP-IDC-32DN
SNAP-IDC-HDB-FM	Factory Mutual approved Fusing LED for each input point	SNAP-IDC-32-FM
SNAP-UDC-HDB	Small footprint Spring clamps LED for each input point	SNAP-IDC-32, SNAP-IDC-32-FM SNAP-IDC-32N SNAP-IDC-32D SNAP-IDC-32DN
SNAP-UDC-HDB-G4	Spring clamps Monitors loads up to 3 A per point using G4 input modules (sold separately)	SNAP-IDC-32DN (5 V G4) SNAP-IDC-32N (15 V or 24 V G4)
SNAP-TEX-FB16-H	Fusing Fuse-blown indicators Bussed power, 120–240 V Use 2 boards per module.	SNAP-IDC-32, SNAP-IDC-32-FM SNAP-IDC-32N SNAP-IDC-32D SNAP-IDC-32DN
SNAP-TEX-FB16-L	Fusing Fuse-blown indicators Bussed power, 12–24 V Use 2 boards per module.	SNAP-IDC-32, SNAP-IDC-32-FM SNAP-IDC-32N SNAP-IDC-32D SNAP-IDC-32DN
SNAP-TEX-32	Straight-through wiring	SNAP-IDC-32, SNAP-IDC-32-FM SNAP-IDC-32N SNAP-IDC-32D SNAP-IDC-32DN

For 32-point HDD output modules:

Board	Features	Used with
SNAP-ODC-HDB	Fusing	SNAP-ODC-32-SRC SNAP-ODC-32-SNK
SNAP-ODC-HDB-FM	Factory Mutual approved Fusing	SNAP-ODC-32-SRC-FM SNAP-ODC-32-SNK-FM
SNAP-UDC-HDB	Small footprint Spring clamps	SNAP-ODC-32-SNK SNAP-ODC-32-SNK-FM SNAP-ODC-32-SRC SNAP-ODC-32-SRC-FM
SNAP-UDC-HDB-G4	Spring clamps Switches loads up to 3 A per point using G4 output modules (sold separately)	SNAP-ODC-32-SNK SNAP-ODC-32-SNK-FM
SNAP-TEX-MR10-16C	Mechanical relays (included) switch up to 6 A per point. Use 2 boards per module.	SNAP-ODC-32-SRC SNAP-ODC-32-SRC-FM
SNAP-TEX-FB16-H	Fusing Fuse-blown indicators Bussed power, 120–240 V Use 2 boards per module.	SNAP-ODC-32-SNK SNAP-ODC-32-SNK-FM SNAP-ODC-32-SRC SNAP-ODC-32-SRC-FM
SNAP-TEX-FB16-L	Fusing Fuse-blown indicators Bussed power, 12–24 V Use 2 boards per module.	SNAP-ODC-32-SNK SNAP-ODC-32-SNK-FM SNAP-ODC-32-SRC SNAP-ODC-32-SRC-FM
SNAP-TEX-32	Straight-through wiring	SNAP-ODC-32-SNK SNAP-ODC-32-SNK-FM SNAP-ODC-32-SRC SNAP-ODC-32-SRC-FM

Attaching the Cable

Cables (wiring harness assemblies) are sold separately. See the compatibility chart in "Wiring the Module" on page 4 to determine the cable you need. If you are making your own cables, see page 14.

1. Plug the cable into the wiring connector(s) on the top of the module.
2. Secure the harness cable so that its weight is supported. The connector plug is not designed to support the weight of the cable.

Setting Up the Breakout Board

For ease in wiring the module to field devices, we recommend you use a breakout board or install a barrier strip in a convenient location.

Wiring varies based on the module, cable, and breakout board combination. See the wiring diagrams and instructions in form 1756, *SNAP TEX Cables and Breakout Boards Data Sheet*.

TESTING FIELD CONNECTIONS

Once you have the module wired, we recommend testing field wiring locally using the OptoTerminal-G20 (sold separately). For input and output modules, you can use the terminal to read point states; for output modules, you can also use it to write to individual output points.

CAUTION: The OptoTerminal-G20 is for use with SNAP high-density modules only, and is the only display device intended for use with these modules. Any use of the display device on other equipment, or the use of another display device with a high-density digital module, may damage your equipment.

Reading Point States

1. Turn on power to the rack.
2. Use the correct cable to connect the OptoTerminal-G20 to the RJ-45 connector on a 32-channel module or the 6-pin connector on a 16-channel module (match up the keying dots).

    As shown in the diagram below, the OptoTerminal-G20 displays the current state of all points on the module.

Wiring harness not shown
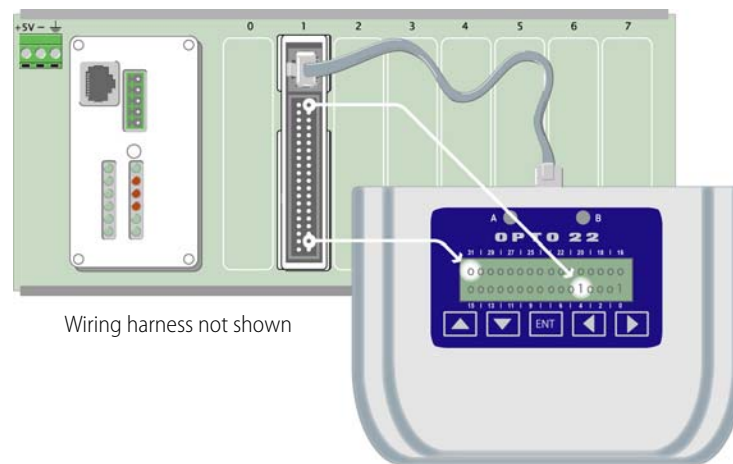
Point states are displayed as a bitmask. Each binary digit represents the state of one point, either on (1) or off (o). The top row shows points 31–16 and the bottom row shows points 15–0.

In the following example, points 0, 2, 4, 5, 9, 12, 13, 15, 17, 18, 19, 22, 23, 26, 28, and 30 are on, and the remaining points are off. The terminal displays the bitmask in binary format; the hexadecimal equivalent of the bitmask is shown for reference only.
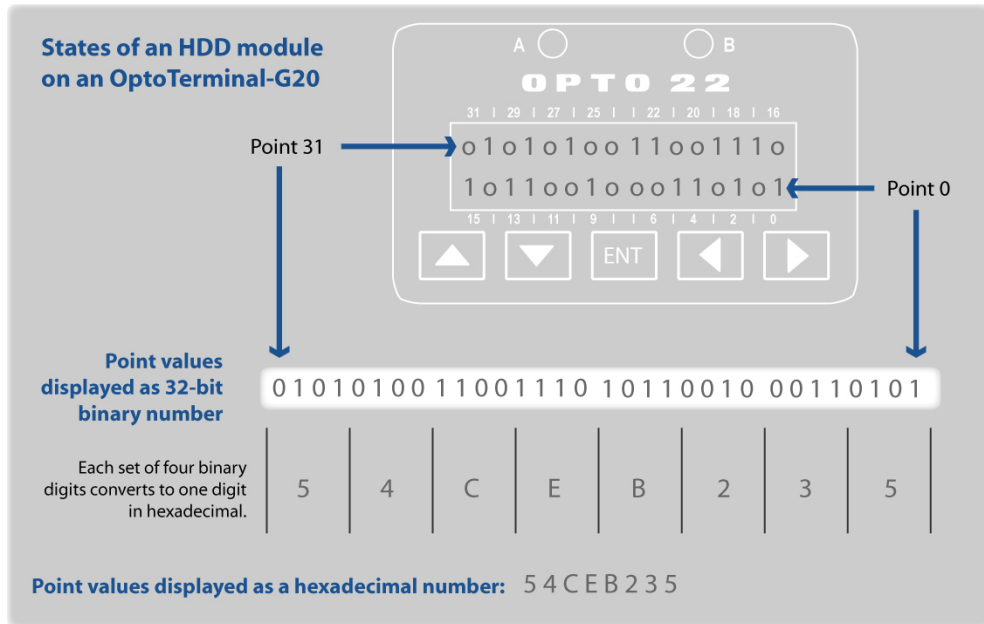
Writing to Output Points

1. Turn off power to the rack.
2. Remove the SNAP brain or controller from the rack to prevent it from overwriting commands from the OptoTerminal-G20. (Commands from the display device have the lowest priority.)
3. Turn on power to the rack.
4. Plug the OptoTerminal-G20 into the RJ-45 connector on top of the output module.

   The terminal shows the current state of output points. In this example, all points are off:
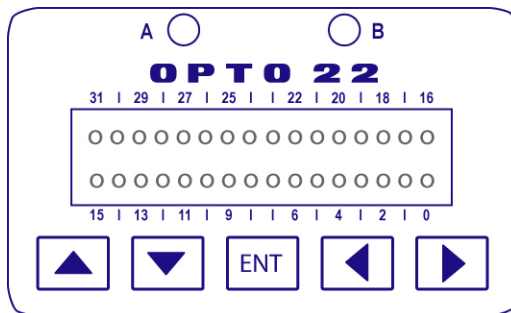
5. Press the arrow keys to select the point you want to turn on or off.

  Up and down arrows move the cursor between rows.

  Left and right arrows move the cursor to select a point.

6. When you have selected the point, press ENT.
7. To turn a point on, press the up or down arrow to select a 1. To turn a point off, press the up or down arrow to select a 0.

   NOTE: The OptoTerminal-G20 displays 1 and 0 for On and Off. A zero is displayed when the value of zero is selected to be written to a point.

8. Press ENT to send the Turn On or Turn Off command.

   If you don't press ENT, the unfinished command is cancelled after 10 seconds, and the display is reset.
9. Watch the output device to make sure it responds.

After the command is sent, the display shows the changed value.

WHAT'S NEXT?

Once you have installed and tested the high-density digital (HDD) module, it is ready for use. Configuration, reading, and writing using PAC Project are similar to 4-channel modules. For differences, see "Comparing High-Density and 4-Channel Digital Modules" on page 11.

You'll find the following guides useful for the information listed. All guides are available on the Opto 22 website, www.opto22.com. The easiest way to locate one is to search on its form number.

For this information	See this guide	Form #
Installing and using the I/O processors (brains and rack-mounted controllers) that support high-density modules	SNAP PAC Brain User's Guide	1690
	SNAP PAC R-Series Controller User's Guide	1595
Reading and writing to HDD modules using PAC Control strategies	PAC Control User's Guide	1700
	PAC Control Command Reference	1701
	PAC Control Commands Quick Reference	1703
One-time reads and writes to high-density modules	PAC Manager User's Guide	1704
Reading and writing to HDD modules from an Allen-Bradley® Logix PLC system	EtherNet/IP for SNAP PAC Protocol Guide	1770
Reading and writing to HDD modules from a Modbus/TCP system	Modbus/TCP Protocol Guide	1678
Reading and writing to HDD modules using a custom program you develop	OptoMMP Protocol Guide	1465

2: Usage Notes and Specifications

This chapter contains the following information:

COMPARING HIGH-DENSITY AND 4-CHANNEL DIGITAL MODULES

SNAP high-density digital modules differ in several ways from 4-channel SNAP digital modules. A few important differences are discussed below; see the table on the next page for more.

Communication with the Processor

One of the main differences between 4-channel and high-density modules is in how the processor (brain or on-the-rack controller) communicates with them on the mounting rack. Four-channel SNAP digital modules communicate with the processor through direct wiring; but SNAP high-density modules communicate as analog and serial modules do, over an internal bus built into the rack and using the processor's analog scanner.

This different communication method means that:

- Communication with the processor (*update time*) is generally slower.
- Communication speed is affected by how "busy" the processor is—that is, how many modules it talks to and how many Ethernet communications the processor is handling at the same time.

Counting

Another difference between 4-channel and high-density digital modules is in counting. For 4-channel SNAP digital input modules, counting is done on the processor. We refer to it as "high-speed" counting because it can be up to 20 KHz, depending on the speed of the module.

For high-density SNAP digital modules, however, the module itself does the counting. The module uses a 16-bit counter (which goes up to 65,535), but the processor used with the module accumulates counts to 32 bits (4,294,967,295) by periodically getting and clearing the module's counts and adding each new count to

what it already has for each point. Update time varies based on the number of modules on the rack and Ethernet communication demands placed on the processor.

Counting speed for high-density digital modules is up to 50 Hz at a 50% duty cycle. This rate is useful for applications that require counting at lower speeds—for example, rotating shafts, flow meters that generate pulses, and electrical meters tuned to slower speeds.

Because counting is done in the module rather than in the processor, you can get counts for HDD modules used with SNAP-PAC-R2 controllers and SNAP-PAC-EB2 and SNAP-PAC-SB2 brains—processors that don't have high-speed counting capability.

4-Channel Digital Counting	High-density Digital Counting
Counters must be started. Counters can be: • Started • Stopped • Read • Read & Cleared Counting is supported on 1-series processors only (R1, EB1, SB1).	Counters are always counting. Counters can be: • Read • Read & Cleared Counters cannot be started or stopped. Counting is done on the module. HDD input counting is supported on all processors (R1, R2, EB1, EB2, SB1, SB2)

Use in PAC Control

In PAC Control, **1-series processors** (SNAP-PAC-R1, SNAP-PAC-EB1, and SNAP-PAC-SB1, including -FM and -W models, and the SNAP-PAC-R1-B) configure and use high-density digital modules much like 4-channel digital modules. However, because of the differences in counters shown in the table above, only the commands Get Counter, Get & Clear Counter, and Clear Counter will have an effect. Since counting is automatic and continuous on the high-density module, be sure you clear the counter each time before starting to use it, so you know it's starting from zero.

Because PAC Control does not allow counting on **2-series processors** (SNAP-PAC-R2, SNAP-PAC-EB2, and SNAP-PAC-SB2, plus their -FM and -W models), you cannot configure points on HDD modules as counters. However, you can work around this limitation by simply enabling and using the legacy HDD module commands: Get HDD Module Counters, Get & Clear HDD Module Counter, and Get & Clear HDD Module Counters. See the *PAC Control User's Guide* for instructions to enable legacy commands. Remember to clear the counter each time before starting to use it, since counting is continuous.

If you not using SNAP PAC brains and controllers but are using older hardware, see "Using HDD Modules with Legacy Hardware" on page 15.)

High-Density and 4-Channel Digital Module Comparison

Item	SNAP High-Density Digital Modules	4-Channel SNAP Digital Modules
Number of points on module	16 or 32, depending on module	4
Isolation and fusing	**16-point input modules:** Each point is optically isolated from other points on the module. **32-point input and output modules:** The module is divided into four groups of eight points. Groups are isolated from each other, but points within a group are not isolated from each other. Groups must be externally fused.	**Input modules:** Each point is optically isolated from other points on the module. **Most output modules:** Points are not isolated from each other. Points share a common fuse. For isolated modules, see form 1144, *SNAP Digital Output Modules Data Sheet*.
Status LEDs	None; use the handheld OptoTerminal-G20 for module diagnostics and commissioning, or for 32-point modules, connect to an optional breakout rack.	One for each point, located on top of module.
Polling time from I/O processor to module[1]	2–30 ms typical[2]	0.5–2 ms typical[2]
Module turn-on/off time[1]	16-point input modules: 15–20 ms 32-point input modules: 6 ms Output modules: 100 microseconds	Varies by module. Examples: • SNAP-IDC5-FAST: 25 microseconds • SNAP-IDC5: 5 ms turn-on, 15 ms turn-off
On/off status	Yes	Yes
Input latching	Yes	Yes
Counting on digital input modules	Counting occurs on the module.[3] Counting is available with SNAP-PAC-R1[4], SNAP-PAC-EB1[4], and SNAP-PAC-SB1 processors. Counting speeds: On 32-point modules, 0–50 Hz @ 50% duty cycle On 16-point modules, 0–25 Hz @ 50% duty cycle (Speed depends on module; see specifications for each part number.)	High-speed counting occurs on the I/O processor (brain or on-the-rack controller) and can be configured for any point. (High-speed counting is available on SNAP-PAC-R1[4], SNAP-PAC-EB1[4], and SNAP-PAC-SB1 processors.) Counting speed varies based on the processor and the speed of the module. Example: SNAP-PAC-EB1 brain with SNAP-IDC5-FAST: up to 20 KHz
Watchdog timer	Firmware 8.1 and higher, yes. Firmware 8.0 and lower, no.	Yes
Pulse generation	Yes	Yes
On-pulse, off-pulse, and Period measurement	No	Yes
Frequency	No	Yes
Totalizer	No	Yes
Digital events	Firmware 8.1 and higher, yes. Firmware 8.0 and lower, no.	Yes

1 Actual turn-on and turn-off times equal the polling time plus the module time.

2 Polling time varies based on the SNAP I/O processor (brain or on-the-rack controller), processor configuration, and Ethernet host communication activity.

3 The high-density digital module uses a 16-bit counter, but the processor used with the module accumulates counts to 32 bits by periodically getting and clearing the module's counts and adding to current values. Update time varies based on number of modules and Ethernet communication demands.

4 Including -FM (Factory Mutual approved) and -W (Wired+Wireless) models, and the SNAP-PAC-R1-B.

BUILDING YOUR OWN CABLES

Header Cable

If you want to build your own SNAP-HD-BF6 header cable for use with a breakout rack, you will need the parts listed below. Both ends of the cable use the same connectors.

Connector: Molex 15-04-5401
Pin housing: Molex 50-57-9320
Pins: Molex p/n 16-02-0103
Cable: Alpha 5020C or Manhattan M38910 (24 AWG, 10 conductor, 4x length needed) or equivalent (UL type CM)

Wiring Harness

If you want to build your own wiring harness, you will need the parts listed below.

For SNAP-HD-ACF6:

Connector: Molex 39-01-2165
Pins: Molex 39-00-0214
Cable: Belden 8308 (22 AWG, 16 conductor, shielded) or equivalent (UL AWM style 2464)

For SNAP-HD-CBF6:

Connector: Molex 15-04-5401
Pin housing: Molex 50-57-9320
Pins: Molex p/n 16-02-0103
Cable: Alpha 5020/40c (24 AWG, 40 conductor) or equivalent (UL type CM)

For complete wiring information, see form 1756, the *SNAP TEX Cables and Breakout Boards Data Sheet*.

NOTES ON LEGACY HARDWARE AND SOFTWARE

For important information on mixing current and legacy products, see Opto 22 form 1688, *SNAP PAC System Migration Technical Note*.

Using HDD Modules with Legacy Hardware

Most high-density digital modules can be used only with SNAP PAC brains and R-series controllers. However, the following table lists some HDD modules that can be installed on I/O units using legacy I/O processors and racks:

These HDD Modules...	...can be used with these legacy processors*	...on these racks	
SNAP-IDC-32 SNAP-ODC-32-SNK SNAP-ODC-32-SRC	SNAP-UP1-M64 SNAP-ENET-S64	SNAP-M16 SNAP-M32	SNAP-M48 SNAP-M64
	SNAP-UP1-ADS SNAP-B3000-ENET SNAP-ENET-RTC	SNAP-B4M SNAP-B8M SNAP-B8MC SNAP-B8MC-P SNAP-B12M	SNAP-B12MC SNAP-B12MC-P SNAP-B16M SNAP-B16MC SNAP-B16MC-P

*Processors must have firmware 6.1 or higher.

Support for these HDD modules on legacy hardware is limited. See form 1688, *SNAP PAC System Migration Technical Note*, for more information.

To check processor firmware and load new firmware if required, follow instructions in form 1714, *PAC Manager User's Guide, Legacy Edition*.

Note that SNAP high-density modules cannot be used with digital-only processors, because high-density modules communicate with the processor as an analog module communicates.

HDD modules can be placed anywhere on B-series racks, even in slots marked "Analog Only."

Using HDD Modules with Legacy Software

For SNAP-IDC-32, SNAP-ODC-32-SNK, and SNAP-ODC-32-SRC modules, it is best to use PAC Control 8.0 or newer. If you do, follow steps in form 1688, *SNAP PAC System Migration Technical Note*, to enable deprecated HDD commands, and use these instead of standard digital commands. You can also use ioControl version 6.1 or newer with the SNAP-IDC-32, SNAP-ODC-32-SNK, and SNAP-ODC-32-SRC modules. Use the separate HDD commands for reading and writing.

Similarly, PAC Manager 8.0 or newer is required for the best use of HDD modules, but you can also use ioManager 6.1 or newer for one-time reads and writes to the same three modules.

If you must read and write to these three modules using ioDisplay 6.0 (not recommended; upgrade to PAC Display or at least to ioDisplay 6.1), see form 1561, *Using ioDisplay 6.0 with SNAP 32-channel Digital Modules Technical Note*.

For all other HDD modules, you cannot use legacy software or hardware. You must use SNAP PAC controllers and brains with the version of PAC Control that supports the specific modules.

G4 Digital I/O

Connecting to field devices through G4 modules

Some 32-point HDD modules can use a special breakout board, the SNAP-UDC-HDB-G4, to monitor and control field devices through G4 modules. The rack accommodates up to 32 G4 single-channel digital input or output modules and attaches to a SNAP 32-point module through a SNAP-HD-BF6 cable.

The advantage of using this breakout board is that G4 modules handle a much higher load than the SNAP module itself: up to 3 A per point. For complete information, see form 1756, *SNAP TEX Cables and Breakout Boards Data Sheet*.

Connecting to existing G4 racks

SNAP-HD-G4F6 header cable

SNAP-ODC-32-SNK module

G4PB16 mounting racks
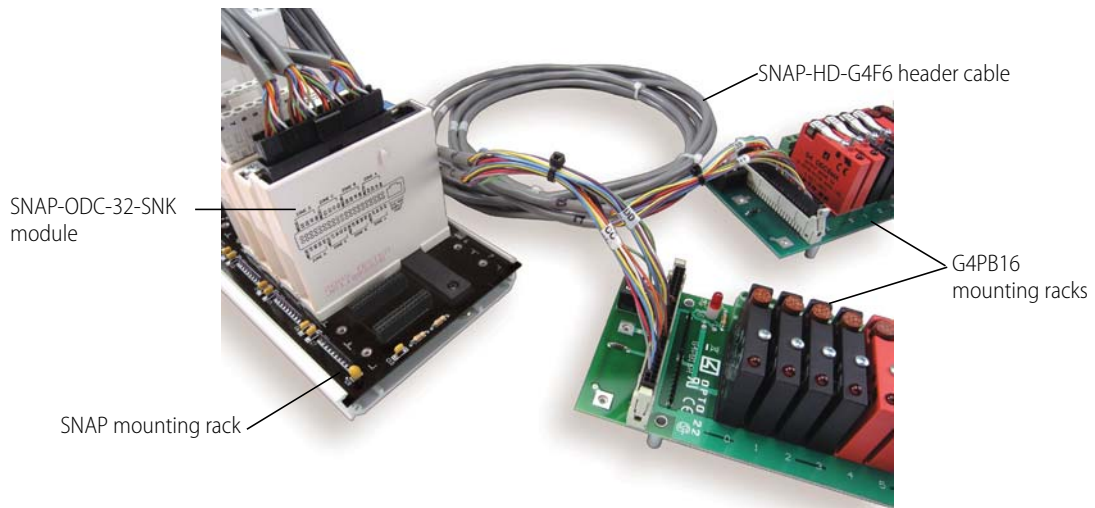
SNAP mounting rack

ALso, some 32-channel HDD modules can connect to existing G4 and G1 mounting racks using a SNAP-HD-G4F6 cable, letting youintegrate older G4 digital I/O systems with modern PAC Project software and SNAP Ethernet-based controllers. For outputs, this connection makes available the G4 module's 3-amp switching capability, which provides twelve times the 0.25 amp capability per point of the high-density digital modules themselves.

These HDD modules and cables also work with some G1 racks, and the SNAP-HD-G4F6 works with some integrated I/O racks.

For more information, see form 1756, *SNAP TEX Cables and Breakout Boards Data Sheet*.

SPECIFICATIONS

Input Modules

	SNAP-IDC-16	SNAP-IDC-HT-16	SNAP-IAC-16	SNAP-IAC-A-16	SNAP-IAC-K-16
Input Range	10–32 VDC/VAC	15–28 VDC/VAC	90–140 VAC/VDC	180–280 VAC/VDC	70–130 VAC/VDC
Nominal Voltage Range	24 VDC	24 VDC	120 VAC	240 VAC	100 VAC
Input Resistance	44 K ohms	4 K ohms	300 K ohms	940 K ohms	220 K ohms
Logic Voltage and Current	5 VDC ± 0.1 @ 150 mA	5 VDC ± 0.1 @ 150 mA	5 VDC ± 0.1 @ 150 mA	5 VDC ± 0.1 @ 150 mA	5 VDC ± 0.1 @ 150 mA
Input Arrangement	16 isolated input channels			16 isolated input channels	
Channel-to-Channel Isolation	250 V steady-state, 1500 V transient			250 V steady-state, 1500 V transient	
Maximum Operating Common Mode Voltage	250 V	250 V	250 V	250 V	250 V
Isolation: Field to Logic	1500 V	1500 V	1500 V	1500 V	1500 V
Maximum Number of HDD Modules on One Mounting Rack	16	16	16	16	16
Indicators	None; use optional OptoTerminal-G20 diagnostic display.		None; use optional OptoTerminal-G20 diagnostic display.		
ON Voltage	10 VDC @ 0.230 mA	15 VDC @ 3.50 mA	90 VAC/VDC @ 0.3 mA	180 VAC/VDC @ 0.191 mA	70 VAC/VDC @ 0.3 mA
OFF Voltage	3 VDC @ 0.05 mA	9 VDC @ 2.0 mA	40 VAC/VDC @ 0.135 mA	40 VAC/VDC @ 0.043 mA	30 VAC/VDC @ 0.135 mA
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Polling time from I/O processor to module[1]	2–30 ms typical[2]	2–30 ms typical[2]	2–30 ms typical[2]	2–30 ms typical[2]	2–30 ms typical[2]
Input Turn-On/Off Time	15 ms turn-on time 20 ms turn-off time	20 ms turn-on time 25 ms turn-off time	15 ms turn-on time 20 ms turn-off time	15 ms turn-on time 20 ms turn-off time	15 ms turn-on time 20 ms turn-off time
Counting Frequency (DC input)	0–25 Hz @ 50% duty cycle	0–15 Hz @ 50% duty cycle	0–25 Hz @ 50% duty cycle	0–25 Hz @ 50% duty cycle	0–25 Hz @ 50% duty cycle
Operating Temperature	-20 to 70 °C	-20 to 70 °C	-20 to 70 °C	-20 to 70 °C	-20 to 70 °C
Storage Temperature	-40 to 85 °C	-40 to 85 °C	-40 to 85 °C	-40 to 85 °C	-40 to 85 °C
Agency Approvals	UL, CE, RoHS, DFARS	CE, RoHS, DFARS	UL, CE, RoHS, DFARS	UL, CE, RoHS, DFARS	CE, RoHS, DFARS
Warranty	Lifetime	Lifetime	Lifetime	Lifetime	Lifetime

1 Affects turn-on and turn-off determination
2 Time varies based on the SNAP PAC I/O processor (brain or on-the-rack controller), processor configuration, and Ethernet host communication activity.

	SNAP-IDC-32 SNAP-IDC-32-FM	SNAP-IDC-32N	SNAP-IDC-32D	SNAP-IDC-32DN
Input Range	10 to 32 VDC	-10 to -32 VDC	2.5 to 12 VDC	-2.5 to -12 VDC
Nominal Voltage Range	24 VDC	-12 to -24 VDC	2.5 VDC	-2.5 VDC
Input Resistance	20 K ohms	20 K ohms	3 K ohms	3 K ohms
Logic Voltage and Current	5 VDC ± 0.1 @ 150 mA		5 VDC ± 0.1 @ 150 mA	
Maximum Operating Common Mode Voltage	250 V	250 V	250 V	250 V
Isolation: Field to Logic	1500 V	1500 V	1500 V	1500 V
Input Arrangement	32 input channels; 4 groups of 8 inputs each		32 input channels; 4 groups of 8 inputs each	
Common connection	Points in each group share a common **negative** connection.	Points in each group share a common **positive** connection.	Points in each group share a common **negative** connection.	Points in each group share a common **positive** connection.
Channel-to-Channel Isolation	No channel-to-channel isolation; 100 V group-to-group isolation		No channel-to-channel isolation; 100 V group-to-group isolation	
Hold-down screws Connector screws	Torque: 4 in-lb (0.45 N-m) Torque: 5.26 in-lb (0.6 N-m)		Torque: 4 in-lb (0.45 N-m) Torque: 5.26 in-lb (0.6 N-m)	
Maximum Number of HDD Modules on One Mounting Rack	16	16	16	16
Indicators	None; use optional OptoTerminal-G20 diagnostic display or breakout rack.			
ON Voltage	10 VDC @ 0.5 mA	-10 VDC @ 0.5 mA	2.5 VDC @ 0.5 mA	-2.5 VDC @ 0.5 mA
OFF Voltage	3 VDC @ 0.1 mA	-3 VDC @ 0.1 mA	1 VDC @ 0.1 mA	-1 VDC @ 0.1 mA
Polling time from I/O processor to module[1]	2–30 ms typical[2]	2–30 ms typical[2]	2–30 ms typical[2]	2–30 ms typical[2]
Input Turn-On/Off Time	6 ms	6 ms	6 ms	6 ms
Counting Frequency (DC input)	0–50 Hz @ 50% duty cycle	0–50 Hz @ 50% duty cycle	0–50 Hz @ 50% duty cycle	0–50 Hz @ 50% duty cycle
Operating Temperature	-20 to 70 °C	-20 to 70 °C	-20 to 70 °C	-20 to 70 °C
Storage Temperature	-40 to 85 °C	-40 to 85 °C	-40 to 85 °C	-40 to 85 °C
Agency Approvals	UL, CE, RoHS, DFARS FM (-FM model only)	CE, RoHS, DFARS	CE, RoHS, DFARS	CE, RoHS, DFARS
Warranty	Lifetime	Lifetime	Lifetime	Lifetime

1 Affects turn-on and turn-off determination
2 Time varies based on the SNAP PAC I/O processor (brain or on-the-rack controller), processor configuration, and Ethernet host communication activity.

Output Modules

	SNAP-ODC-32-SRC SNAP-ODC-32-SRC-FM	SNAP-ODC-32-SNK SNAP-ODC-32-SNK-FM
Switching Voltage	5–60 VDC	5–60 VDC
Nominal Switching Voltage	12–24 VDC	12–24 VDC
Logic Voltage and Current	5 VDC ± 0.1 @ 150 mA	5 VDC ± 0.1 @ 150 mA
Maximum Off State Voltage	60 VDC	60 VDC
Output Leakage, Typical	<10 microamps per channel (60 V, 70 °C)	<10 microamps per channel (60 V, 70 °C)
Maximum Load per Point	0.25 A	0.25 A
Voltage Drop	0.15 VDC @ 0.25 A	0.15 VDC @ 0.25 A
Surge (1 sec.)	1 A	1 A
Output Arrangement	32 output channels; 4 groups of 8 outputs each. Points in each group share a common positive connection.	32 output channels; 4 groups of 8 outputs each. Points in each group share a common negative connection.
Maximum Operating Common Mode Voltage	250 V	250 V
Isolation: Field to Logic	1500 V	1500 V
Output Turn-On/Off Time	100 microseconds	100 microseconds
Polling time from I/O processor to module[1]	2–30 ms typical[2]	2–30 ms typical[2]
Indicators	None; use optional OptoTerminal-G20 diagnostic display or breakout rack.	None; use optional OptoTerminal-G20 diagnostic display or breakout rack.
Maximum Number of HDD Modules on One Mounting Rack	16	16
Torque, hold-down screws	4 in-lb (0.45 N-m)	4 in-lb (0.45 N-m)
Torque, connector screws	5.26 in-lb (0.6 N-m)	5.26 in-lb (0.6 N-m)
Operating Temperature	-20 to 70 °C	-20 to 70 °C
Storage Temperature	-40 to 85 °C	-40 to 85 °C
Agency Approvals	SNAP-ODC-32-SRC: UL, CE, RoHS, DFARS SNAP-ODC-32-SRC-FM: CE, FM, RoHS, DFARS	SNAP-ODC-32-SNK: UL, CE, RoHS, DFARS SNAP-ODC-32-SNK-FM: CE, FM, RoHS, DFARS
Warranty	Lifetime	Lifetime

1 Affects turn-on and turn-off determination
2 Time varies based on the SNAP PAC I/O processor (brain or on-the-rack controller), processor configuration, and Ethernet host communication activity.

DIMENSIONAL DRAWINGS
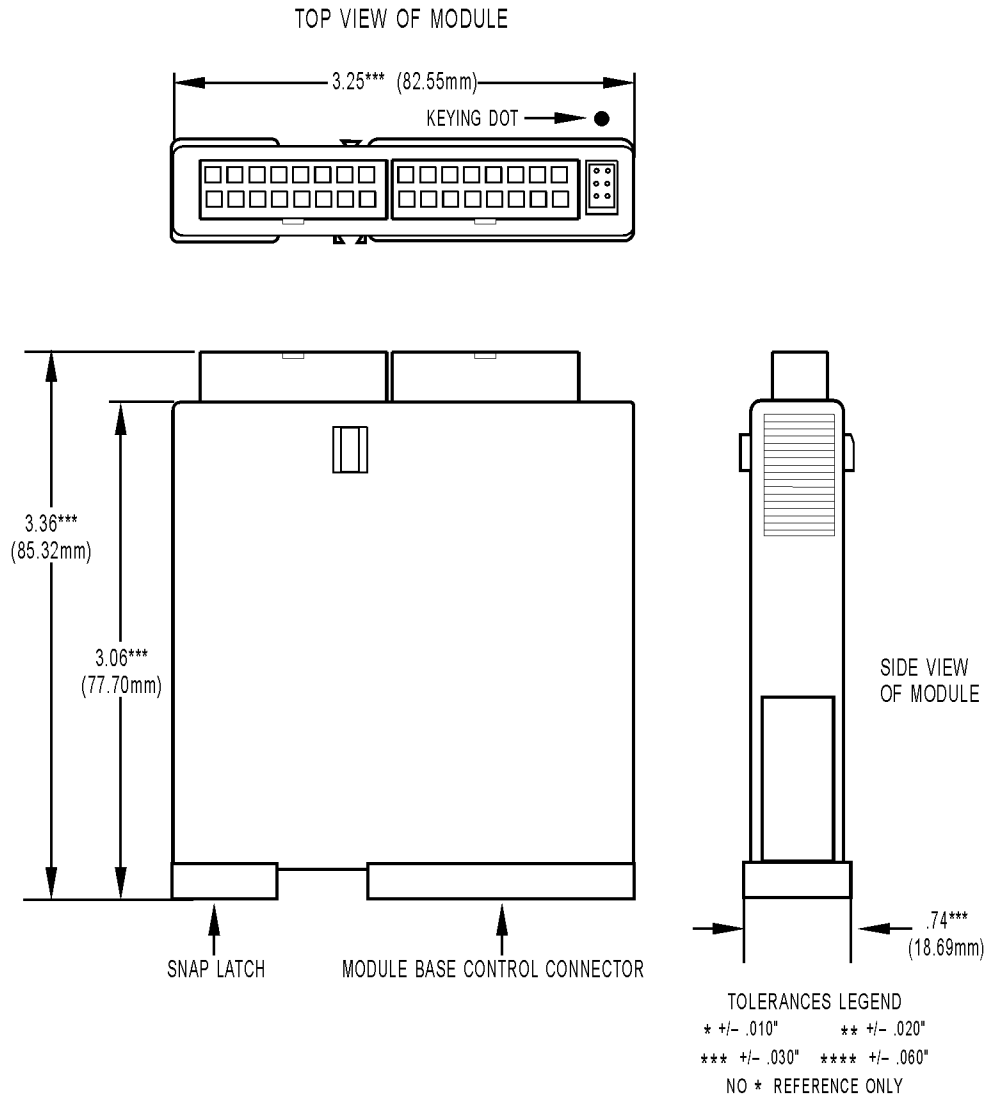
SNAP 16-Channel Digital Modules
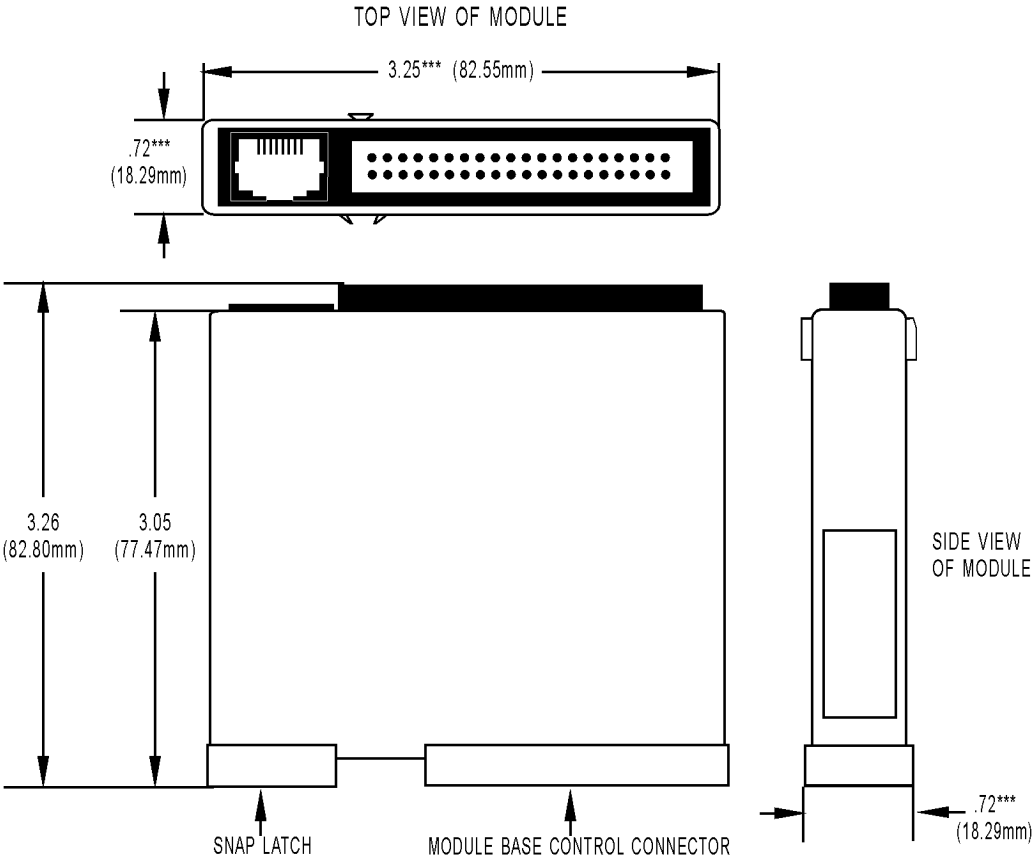
TOP VIEW OF MODULE

3.25*** (82.55mm)

KEYING DOT ●

3.36***
(85.32mm)

3.06***
(77.70mm)

SNAP LATCH   MODULE BASE CONTROL CONNECTOR

SIDE VIEW
OF MODULE

.74***
(18.69mm)

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

SNAP 32-Channel Digital Modules

TOP VIEW OF MODULE

3.25*** (82.55mm)

.72***
(18.29mm)

3.26
(82.80mm)

3.05
(77.47mm)

SNAP LATCH

MODULE BASE CONTROL CONNECTOR

SIDE VIEW
OF MODULE

.72***
(18.29mm)

TOLERANCES LEGEND
* +/- .010"   ** +/- .020"
*** +/- .030"   **** +/- .060"
NO * REFERENCE ONLY
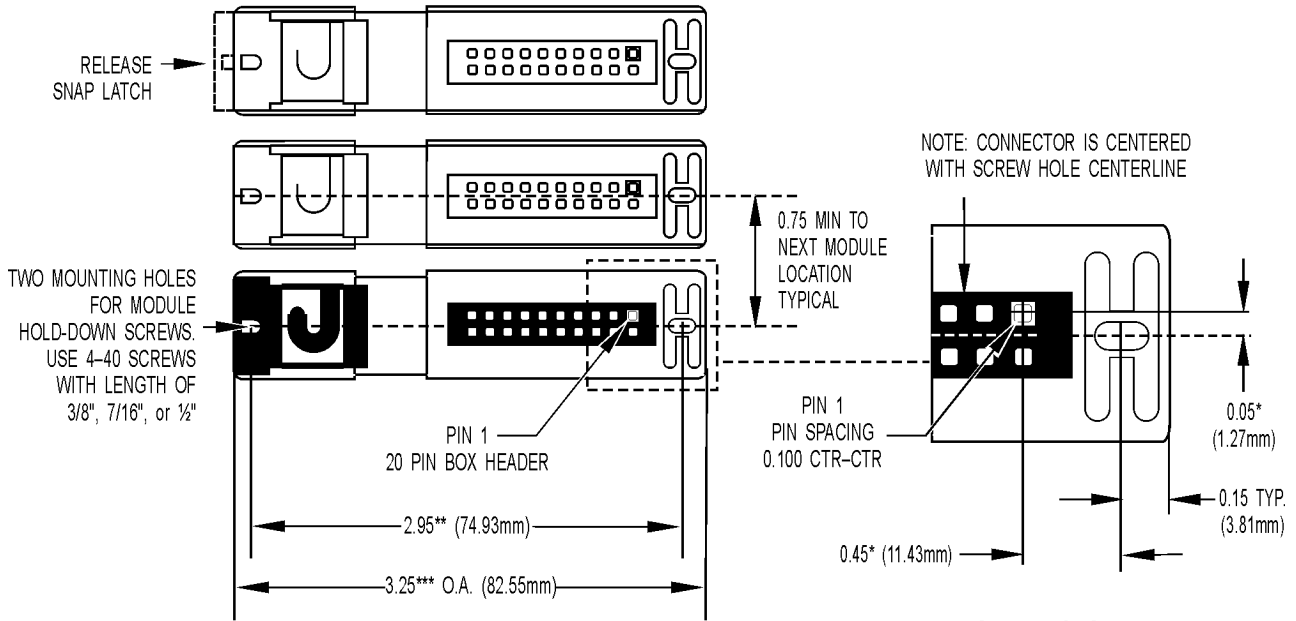
SNAP 32-Channel Digital Modules (continued)

BOTTOM VIEW OF MODULE

RELEASE
SNAP LATCH

TWO MOUNTING HOLES
FOR MODULE
HOLD-DOWN SCREWS.
USE 4–40 SCREWS
WITH LENGTH OF
3/8", 7/16", or ½"

PIN 1
20 PIN BOX HEADER

2.95** (74.93mm)

3.25*** O.A. (82.55mm)

NOTE: CONNECTOR IS CENTERED
WITH SCREW HOLE CENTERLINE

0.75 MIN TO
NEXT MODULE
LOCATION
TYPICAL

PIN 1
PIN SPACING
0.100 CTR–CTR

0.45* (11.43mm)

0.05*
(1.27mm)

0.15 TYP.
(3.81mm)

TOLERANCES
* +/− 0.010"
** +/− 0.020"
*** +/− 0.030"
NO * REFERENCE ONLY

IMPORTANT: *The mounting rack connector has 24 pins; the module connector has 20 pins. The extra pins on the mounting rack connector prevent misalignment of the module during installation.*

SNAP 32-Channel Digital Modules (continued)

NOTE: CONSIDER
NECESSARY DIMENSIONS
FOR WIRING HARNESS

SNAP PAC BRAIN

MODULE

SNAP I/O
MODULE

3.26***
(82.80mm)

MODULE
RETENTION
RAIL

SNAP
I/O RACK
BOARD

BRAIN

3.70***
(93.98mm)

RACK

.50***
(12.70mm)

FOR DIN CLIP ADD ADDITIONAL
.06" TO OVERALL HEIGHT

SNAP-PAC RACK DIN RAIL CLIP MOUNTING OPTION

SNAP RACK BASE EXTRUSION

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

RACK BASE EXTRUSION END CAP

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

DIMENSIONAL DRAWINGS