OPTO 22

DATA SHEET

Form 1000-050221

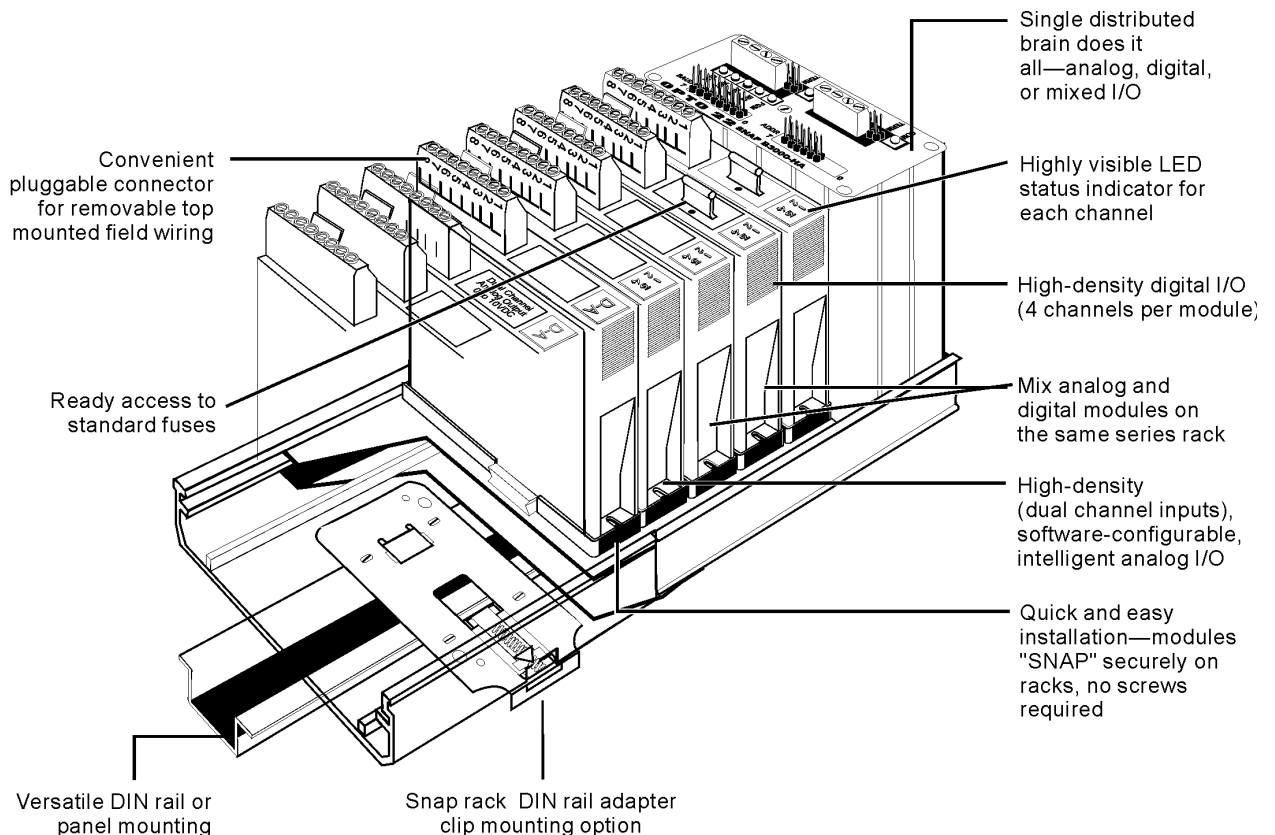| Part Number	Description
B3000-HA	32-channel ARCNET analog and digital brain

Description

The B3000-HA is one of Opto 22's high-performance SNAP brains that remotely control a mix of both analog and digital I/O modules using Opto 22's SNAP B-series I/O mounting racks. The B3000-HA can be used with either an Opto 22 controller or a host computer. On-board intelligence offers many distributed control functions.

The B3000-HA brain communicates via dual, twisted-pair ARCNET ports. Communicating at 2.5 megabits per second, either port can be used to communicate to a host controller or PC, or both ports can be used for redundant communication. Dual-port ARCNET cards are available for the PC and for the M4 family of controllers from Opto 22.

Using the Mistic protocol, advanced I/O processing—including PID calculations (100-millisecond update), pulse-width duration measurements (100-microsecond resolution), and high-speed counting (20,000 Hz)—can all be done simultaneously on separate channels of the same I/O mounting rack.
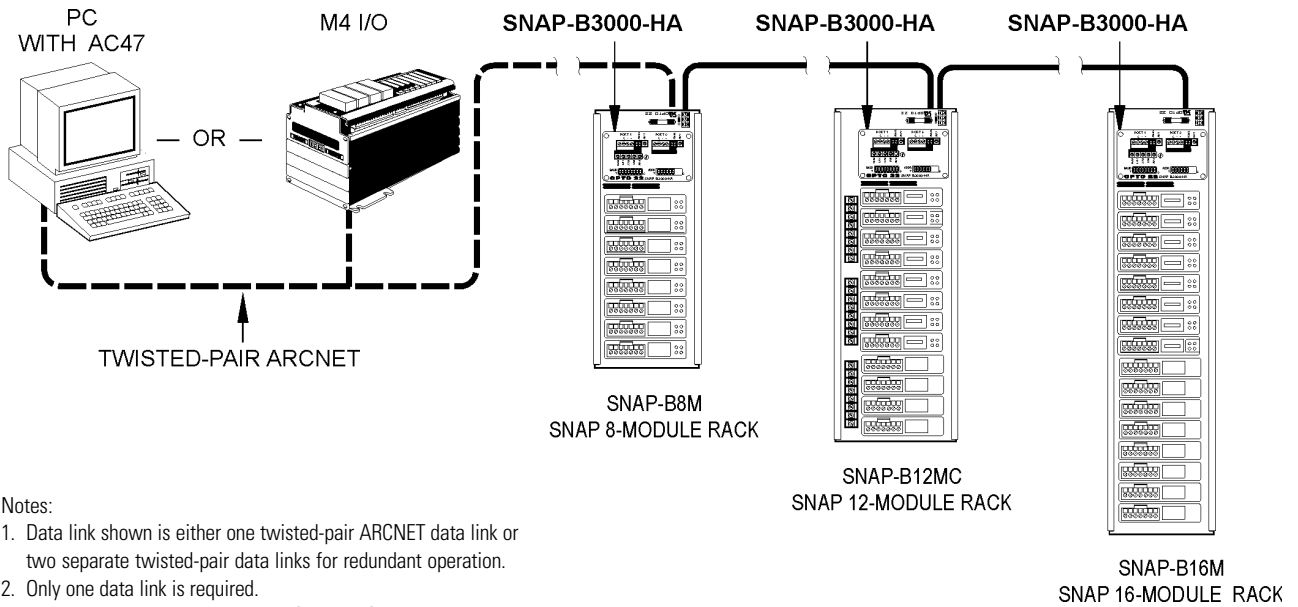
Using the Mistic protocol and an Opto 22 controller, SNAP I/O customers can take advantage of FactoryFloor, Opto 22's suite of Microsoft® Windows® 32-bit software. OptoControl, the programming cornerstone of FactoryFloor, uses the distributed control capability of the B3000-HA brain and takes advantage of the graphical Windows 95 or Windows NT® interface to make it easy to configure, design, and troubleshoot your control system.

For applications not using FactoryFloor, Opto 22's OptoDriver Toolkit—Mistic I/O and Optomux—can be used for direct communications from a host PC to the SNAP-B3000. The toolkit includes 32-bit Windows drivers, 16-bit Windows drivers, and Opto 22's Classic DOS drivers. The kit also provides the files, documentation, and examples needed to write Microsoft Windows and DOS software applications. Programmers can access the Opto 22 I/O hardware using high-level languages such as Microsoft Visual C++® or Microsoft Visual Basic®.

Single distributed brain does it all—analog, digital, or mixed I/O

Highly visible LED status indicator for each channel

High-density digital I/O (4 channels per module)

Mix analog and digital modules on the same series rack

High-density (dual channel inputs), software-configurable, intelligent analog I/O

Quick and easy installation—modules "SNAP" securely on racks, no screws required

Convenient pluggable connector for removable top mounted field wiring

Ready access to standard fuses

Versatile DIN rail or panel mounting

Snap rack DIN rail adapter clip mounting option

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Description (continued)

B3000-HA System Architecture

PC WITH AC47 — OR — M4 I/O

SNAP-B3000-HA   SNAP-B3000-HA   SNAP-B3000-HA

TWISTED-PAIR ARCNET

SNAP-B8M
SNAP 8-MODULE RACK

SNAP-B12MC
SNAP 12-MODULE RACK

SNAP-B16M
SNAP 16-MODULE RACK

Notes:
1. Data link shown is either one twisted-pair ARCNET data link or two separate twisted-pair data links for redundant operation.
2. Only one data link is required.
3. Brains can be either B3000-HA or SNAP-BRS-HA, in any combination.
4. B3000-HA does not support interrupts, IRQs.

B3000-HA Functions

Digital Functions	Analog Functions
Input Latching	PID Loop Control
Pulse Duration Measurement (0.1 msec resolution)	High/Low Limit Monitoring
	Thermocouple Linearization
Counting (32-bit at 20kHz)	Digital Filtering
On/Off Time Totalization	Ramping/Waveform Generation
Output Pulse Generation (0.1 msec resolution)	Programmable Offset and Gain
	Engineering Unit Scaling
Time-Proportional Output (1 msec resolution)	Square Root Extraction
On/Off Status	
Time Delays	

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Specifications

Power Requirements	5.0 VDC ± 0.1 VDC at 1.0A max.
Operating Temperature	0° to 70° C, 5–95% humidity, non-condensing
CPU	16-bit Intel 80C196 I/O processor
Communications Interface	Node 0 and Node 1; twisted-pair ARCNET at 2.5 megabits per second. Either port can be used, or both ports can be used for redundant processor-to-I/O communication.
Data Rates	2.5 megabits per second; baud jumpers, although present, have no effect.
Range (Multidrop Mode):	Up to 1,000 feet with up to 17 nodes. Repeaters and conversion from Coax cable are commercially available.
Counter/Frequency Measurement	Maximum Rate: 20 kHz Minimum Pulse Width: 10 µsec
Output Pulse	Maximum Rate: 500 Hz Minimum Pulse Width: 1 msec
PID Update Rate	100 msec (for 1 to 8 PID loops)
LED Indicators	RUN (Power On), XMT (Activity), PGM (Program), and COM ports
Options: Jumper Selectable	Address, Node 0 Termination, Node 1 Termination
Cable	CAT-3 or CAT-5 UTP

Connectors And Jumpers

Top View: B3000-HA SNAP Brain

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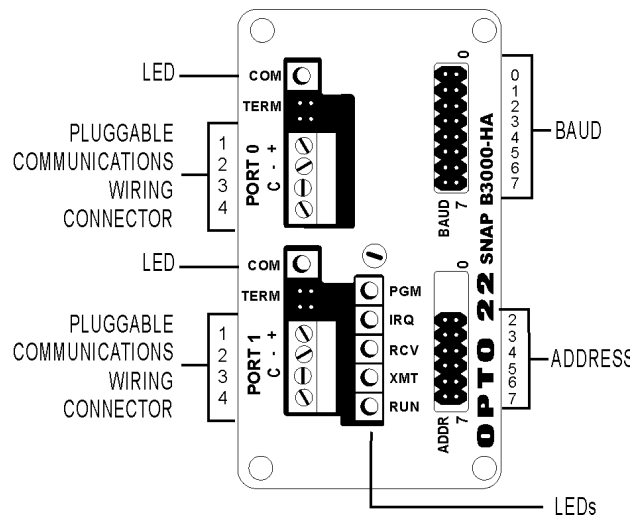
Specifications (continued)
Communication Jumpers/Wiring
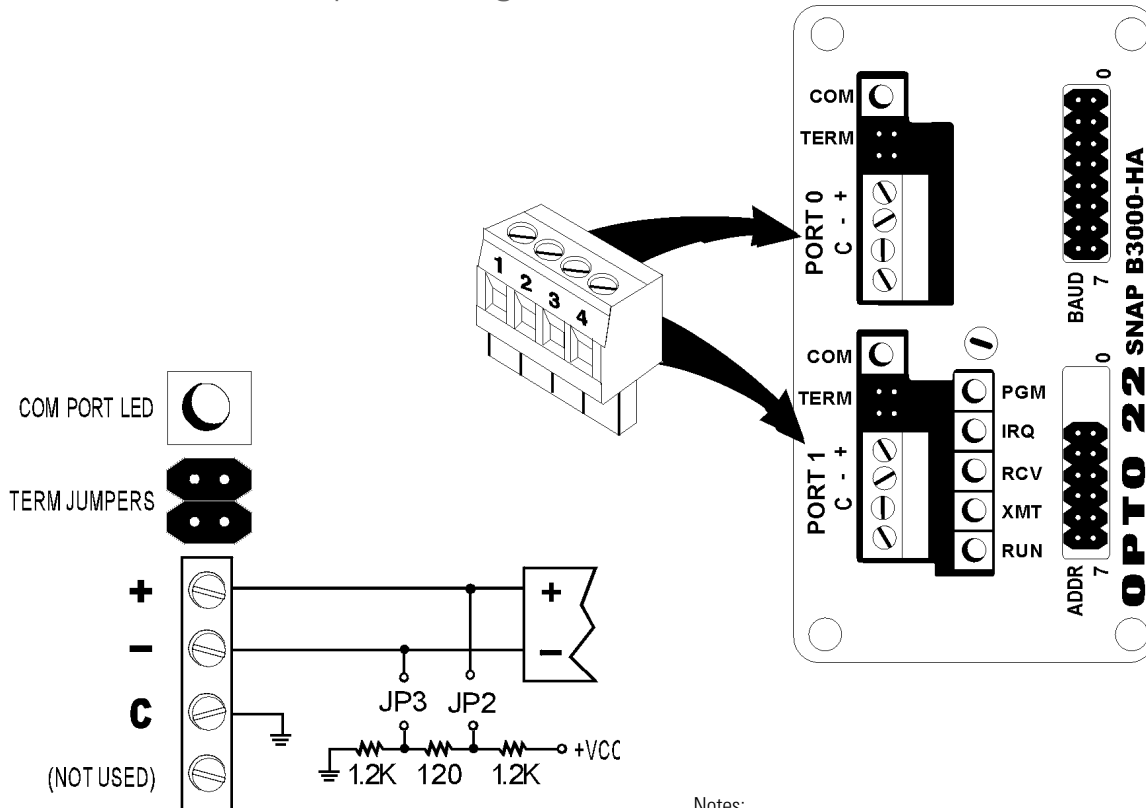
Notes:

1. CAT-3 or CAT-5 UTP cable must be used.
2. The unused pairs (wires) of the cable should be grounded at one end only.
3. When connecting devices on an ARCNET network, be sure to connect the positive terminal of one device to the positive terminal of the next device, and the negative terminal of one device to the negative terminal of the next device.
4. Node termination jumpers are provided to terminate the ARCNET transmission line if this brain is at the end of the data link. Install both node jumpers if this brain is at the end of the link. Do not install any jumpers if this brain is located in the middle of the communication link.
5. The two "nodes" are not two separate addresses, but the same address. The second node is for redundant communications only.

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Specifications (continued)
Baud/Address Jumpers and LED Descriptions

B3000-HA SNAP Brain
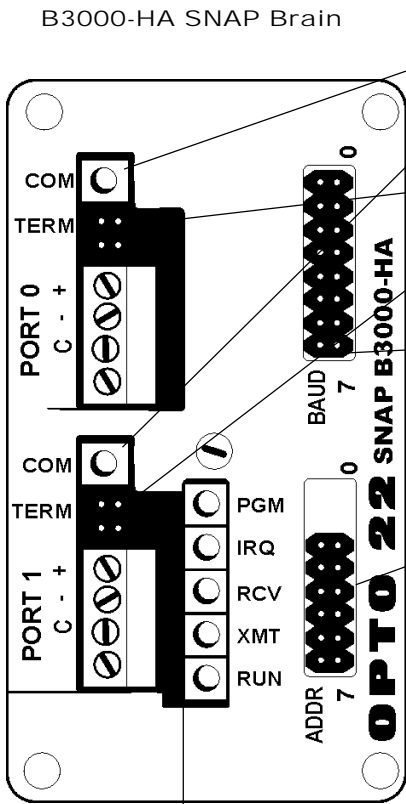
COM LEDs
When configured for redundant communication, only one port is active at a time. Only the active port will have the com LED lit.

NODE Termination Jumpers
If the B3000-HA is at the physical end of the ARCNET communication link, install both NODE jumpers for that node. Do not install NODE jumpers if the brain is not at the end of the link.

BAUD Jumpers
Although BAUD jumpers are present on the B3000-HA, they have no effect on the operation of the brain. All ARCNET communication is at 2.5 megabits per second.

Address/Node ID Jumpers
Address jumpers 0 and 1 are not used on the B3000-HA SNAP brain. If they are present, they have no function. All B3000-HA addresses begin at 4 or at an even multiple of 4. Address 0 is not valid. The ARCNET Node ID will be the same for both ports. It will match the address of the brain.

LED Descriptions

LED	Description
PGM	LED is on during Flash memory upgrade. Normally LED is off.
IRQ	Not supported.
RCV	Not supported.
XMT	Indicates activity on the communication line.
RUN	Processor has power (at least 4.75 VDC).

Address Jumpers

■ = JUMPER INSTALLED   □ = NO JUMPER

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B3000-HA I/O Mapping

The largest SNAP B-series I/O rack can contain a maximum of 16 modules. As shown below, the first eight modules can be either digital or analog. The last eight modules can be analog only. Because of the rack's flexibility in handling both digital and analog inputs and outputs in many of the same module positions, you can choose where to install modules and how to use the points.

The following page explains addressing for the digital and analog modules.

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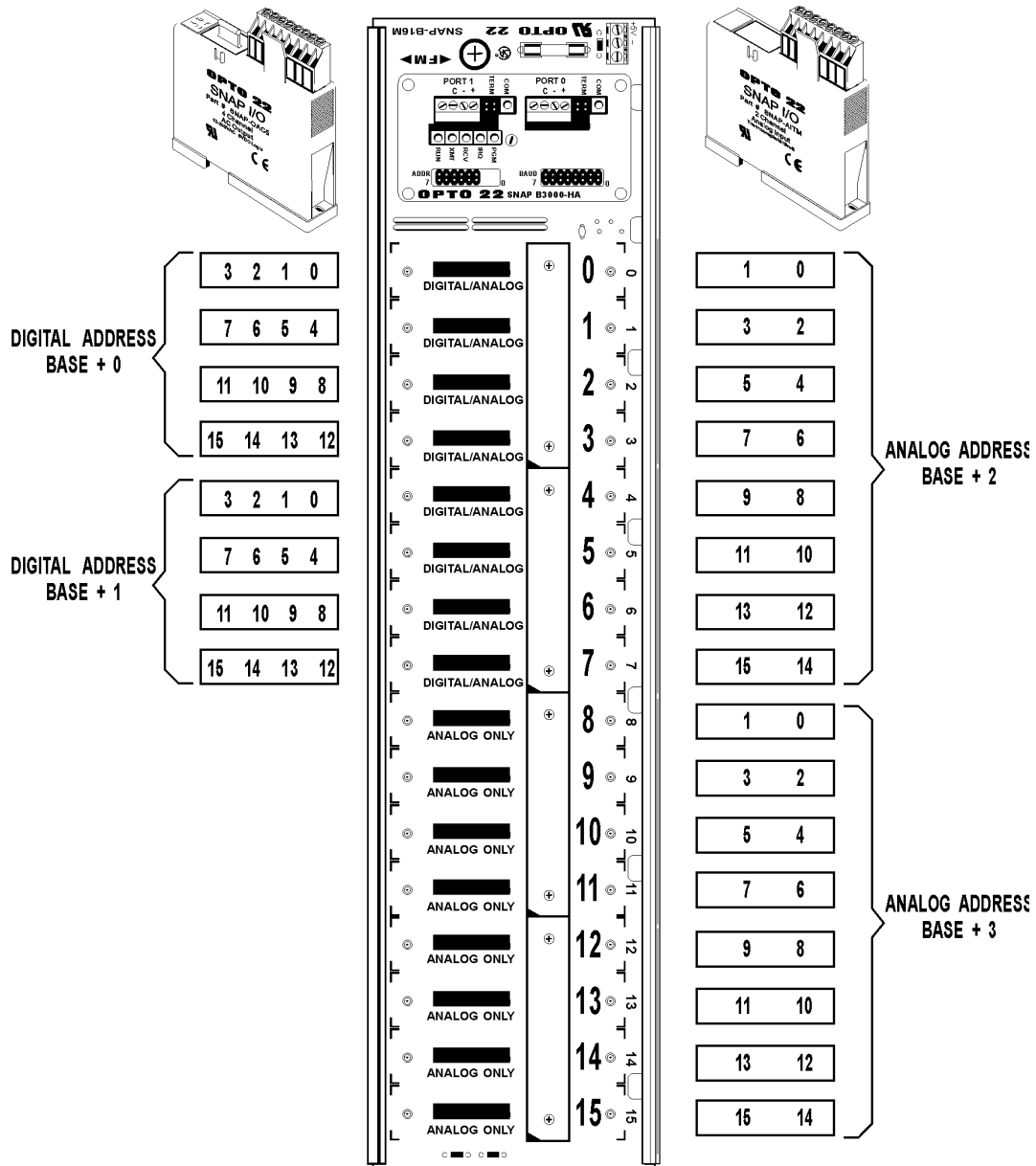
B3000-HA I/O Mapping (Continued)

The B3000-HA SNAP brain is connected to a SNAP B-Series I/O rack, which can hold either 8, 12, or 16 SNAP modules. Digital modules (either input or output) contain four channels of I/O. Analog input modules contain two channels, and analog output modules contain either one or two channels. Both analog and digital modules can be on the same rack.

As shown in the diagram on the previous page, a B3000-HA is capable of addressing a maximum of 32 channels of digital I/O and 32 channels of analog I/O. However, the I/O mounting racks will not accommodate 32 channels of both digital and analog.

The actual number of channels available depends on the combination of modules chosen. For example, the SNAP-B16M rack can mount 16 modules. Up to eight of these modules can be digital, providing 32 channels of digital I/O. The remaining eight module positions can be analog, providing up to 16 channels of analog I/O. However, if all 16 modules are analog, up to 32 channels of analog I/O are available.

I/O on the B3000-HA brain is divided into four addresses of I/O (two digital I/O and two analog I/O). The digital addresses are base+0 and base+1. The analog addresses are base+2 and base+3. Therefore, if a SNAP brain is configured at address 12, the digital addresses would be 12 and 13 and the analog addresses would be 14 and 15.

First Four Module Positions (0–3):
Each position can hold either a digital or an analog module. They can be all analog, all digital, or any mix of both. These four positions constitute the 16 digital channels of digital address base+0, or the first eight analog channels of analog address base+2.

Second Four Module Positions (4–7):
Each position can hold either a digital or an analog module. They can be all analog, all digital, or any mix of both. These four positions constitute the 16 digital channels of digital address base+1, or the second eight analog channels of analog address base+2.

Third Four Module Positions (8–11):
These positions can hold analog modules only. These four positions constitute the first eight analog channels of analog address base+3.

Fourth Four Module Positions (12–15):
These positions can hold analog modules only. These four positions constitute the second eight analog channels of analog address base+3.

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OptoControl Port Configuration

Several I/O port designations in OptoControl support twisted-pair ARCNET on PCs and M4 controllers. Ports 12 through 17 are configured as ARCNET ports and can be used as individual ports or in pairs for redundant communication. For redundant communication, the pair must begin on an even boundary (12, 14, or 16).

In the Configure Controllers dialog box, click the Set Up Controller Ports button. Choose the port number. For redundant communication, check the Redundant box to configure a pair of ports beginning with an even address, 12, 14, or 16.
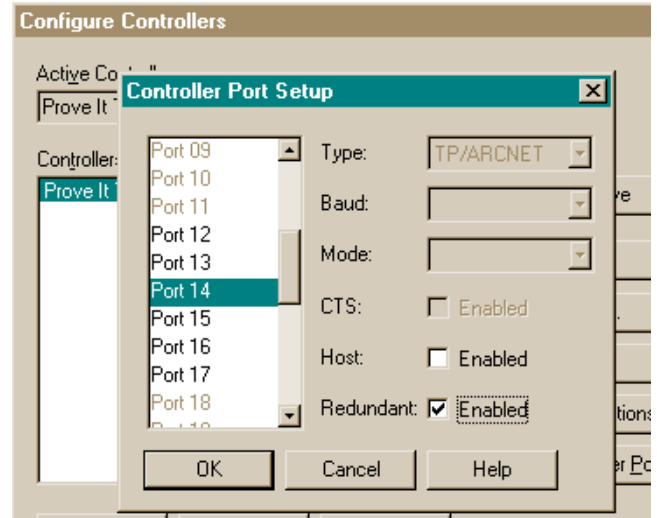
If the Redundant box is checked as shown above, the two ports are grouped together in the Add I/O Unit or Edit I/O Unit dialog box. The following figure shows the Add I/O Unit dialog box with ports 14 and 15 grouped as a redundant pair:

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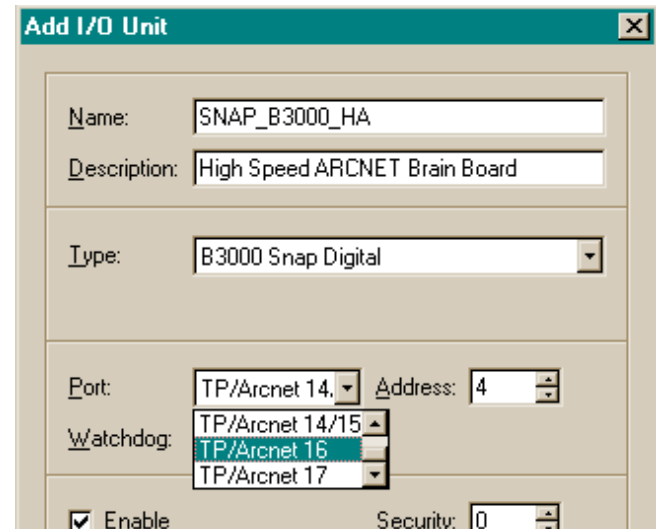
OptoControl I/O Configuration

As the diagram on page 6 shows, positions 0 through 7 on the SNAP rack can contain either digital or analog modules.

If you configure a digital module in position 0 at the address base+0, you cannot configure an analog module in position 0 on analog address base+2. In OptoControl, the Configure I/O Points dialog box will show that those channels are used by a SNAP digital module.

Digital

When configuring the unit, select B3000 SNAP Digital as the Type in the Add I/O Unit dialog box. The digital addresses are base+0 and base+1. If the SNAP brain is configured at address 12 (base), the digital addresses would be 12 and 13. Two separate digital brains must be configured; one at address 12 and the other at address 13.

When any digital I/O point is configured on a SNAP brain, OptoControl automatically creates and configures the other three points in the module. For example, if a digital SNAP point is added at channel 5, then identical points are created at channels 4, 6, and 7. Names are automatically created for these new points based on the name entered for the original point.

You can change the name, description, features, default, and watchdog for each point independently. Note that if the module type of one digital point is changed, then the module type for the other three points in that module is automatically changed to match.

Analog

When configuring the unit, select B3000 SNAP Analog as the Type in the Add I/O Unit dialog box. The analog addresses are base+2 and base+3. If the SNAP brain is configured at address 12 (base), the analog addresses would be 14 and 15. Two separate addresses must be configured.

Inputs—When an input is configured, OptoControl automatically creates and configures the other input point on that module. You can change the name, description, default, and watchdog fields for the other point. You cannot change the module type and scaling.

Outputs—When an output is configured, OptoControl automatically creates and configures the other output channel on that module. Most SNAP analog output modules have two channels. On single-output modules, only the even-numbered channel is usable (0, 2, 4, and so on). The odd-numbered channel is not valid.

Other Notes

Event/reactions and PID loops can only operate on points in the same address group. They behave just like standard I/O in this sense, and cannot cross address boundaries. For example, a PID loop cannot use an input on Address Base+2 to control an output on Base+3, because Base+3 is, logically, a different brain.

Up to 127 event/reactions can be configured per SNAP address.

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Dimensions

B3000-HA
SNAP Brain

3.30 (83.82mm)

.062 (1.57mm)

1.82 (46.18mm)

3.00 (76.31mm)

3.62 (91.95mm)

.109 (2.77mm)

1.75 (44.35mm)

4.37 (111mm)

3.62 (91.95mm)

SNAP I/O RACK BOARD

RACK

.75*** (19.05mm)

FOR DIN CLIP ADD ADDITIONAL .06" TO OVERALL HEIGHT

SNAP RACK DIN RAIL ADAPTER

CUSTOMER SUPPLIED 35mm DIN RAIL
NOTE: BE SURE TO CONSIDER DIN RAIL DIMENSIONS.
(DIN RAIL MUST BE MOUNTED HORIZONTALLY TO USE SNAP I/O WITHOUT MODULE HOLD-DOWN SCREWS)

SNAP RACK BASE EXTRUSION

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

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Assembly

Brain

To install the brain onto a B-Series rack:

1. Turn off power to the rack assembly.

2. If a plastic brain insulator is present on your mounting rack, remove it as shown below.

3. Align the brain connector with the mating connector on the mounting rack.

4. Seat the brain onto the connector.

5. Use the integral hold-down screw to secure the brain in position.

   DO NOT OVERTIGHTEN!

To remove the brain from a B-Series rack:

1. Turn off power to the rack assembly.

2. Loosen the integral hold-down screw on the brain.

3. Pull up on the brain.

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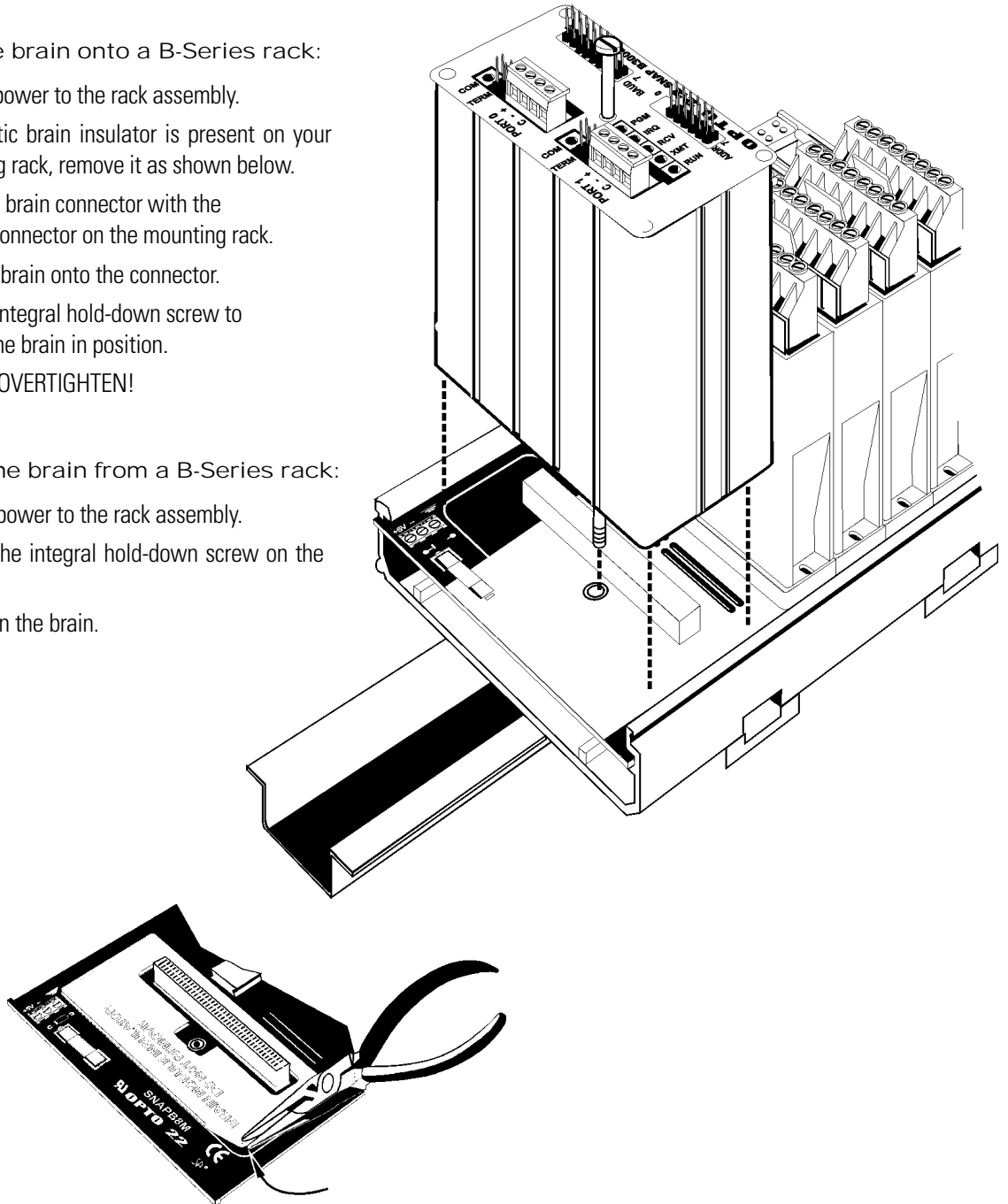
Products

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

SNAP Ethernet Systems

Based on the Internet Protocol (IP), SNAP Ethernet systems offer flexibility in their network connectivity and in the software applications they work with. The physical network may be a wired Ethernet network, a cellular wireless network, or a modem. A wide variety of software applications can exchange data with SNAP Ethernet systems, including:

- Opto 22's own ioProject™ suite of control and HMI software
- Manufacturing resource planning (MRP), enterprise management, and other enterprise systems
- Human-machine interfaces (HMIs)
- Databases
- Email systems
- OPC client software
- Custom applications
- Modbus/TCP software and hardware.

SNAP Ethernet system hardware consists of controllers and I/O units. Controllers provide central control and data distribution. I/O units provide local connection to sensors and equipment.

SNAP OEM Systems

Opto 22 SNAP OEM I/O systems are highly configurable, programmable processors intended for OEMs, IT professionals, and others who need to use custom software with Opto 22 SNAP I/O modules.

Linux® applications running on these systems can read and write to analog, simple digital, and serial I/O points on SNAP I/O modules using easily implemented file-based operations. Applications can be developed using several common development tools and environments, including C or C++, Java, and shell scripts.

M2M Systems

Machine-to-machine (M2M) systems connect your business computer systems to the machines, devices, and environments you want to monitor, control, or collect data from. M2M systems often use wireless cellular communications to link remote facilities to central systems over the Internet, or to provide monitoring and control capability via a cellular phone.

Opto 22's Nvio™ systems include everything you need for M2M—interface and communications hardware, data service plan, and Web portal—in one easy-to-use package. Visit nvio.opto22.com for more information.

Opto 22 Software

Opto 22's ioProject and FactoryFloor® software suites provide full-featured and cost-effective control, HMI, and OPC software to power your Opto 22 hardware. These software applications help you develop control automation solutions, build easy-to-use operator interfaces, and expand your manufacturing systems' connectivity.

Quality

In delivering hardware and software solutions for worldwide device management and control, Opto 22 retains the highest commitment to quality. We do no statistical testing; each product is made in the U.S.A. and is tested twice before leaving our 160,000 square-foot manufacturing facility in Temecula, California. That's why we can guarantee solid-state relays and optically-isolated I/O modules *for life*.

Product Support

Opto 22's Product Support Group offers comprehensive technical support for Opto 22 products. The staff of support engineers represents years of training and experience, and can assist with a variety of project implementation questions. Product support is available in English and Spanish from Monday through Friday, 7 a.m. to 5 p.m. PST.

Opto 22 Web Sites

- www.opto22.com
- nvio.opto22.com
- www.internetio.com (live Internet I/O demo)

Other Resources

- OptoInfo CDs
- Custom integration and development
- Hands-on customer training classes.

About Opto 22

Opto 22 manufactures and develops hardware and software products for industrial automation, remote monitoring, enterprise data acquisition, and machine-to-machine (M2M) applications. Using standard, commercially available Internet, networking, and computer technologies, Opto 22's input/output and control systems allow customers to monitor, control, and acquire data from all of the mechanical, electrical, and electronic assets that are key to their business operations. Opto 22's products and services support automation end users, OEMs, and information technology and operations personnel.

Founded in 1974 and with over 85 million Opto 22-connected devices deployed worldwide, the company has an established reputation for quality and reliability.

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