

Part Number	Description
B100	16-Channel Digital Brain, Mistic Protocol

Description

The B100 is a high-performance digital brain board used to control up to 16 channels of remote digital I/O using Opto 22's digital I/O mounting racks and modules. On-board intelligence enables many distributed control features. The B100 and its analog counterpart, the B200, can be used with either an Opto 22 FactoryFloor® controller or a host computer.

The B100 communicates via RS-485 serial at communication speeds up to 115K baud using the *mistic* protocol. The B100 brain board is physically interchangeable with the older B1 Optomux brain boards for Opto 22 Classic I/O and is plug-compatible with Classic racks. This compatibility makes it possible for a "Classic I/O customer" using Standard, Quad, or G4 I/O to use the *mistic* communications protocol with FactoryFloor software.

Utilizing the *mistic* protocol, fast communication speed is combined with advanced I/O processing to provide performance and power at the I/O level. Time-critical functions such as high-speed counting (20,000 Hz) and pulse width measurement (100 microsecond resolution) can be off-loaded from your host processor to the B100's intelligent I/O processor.

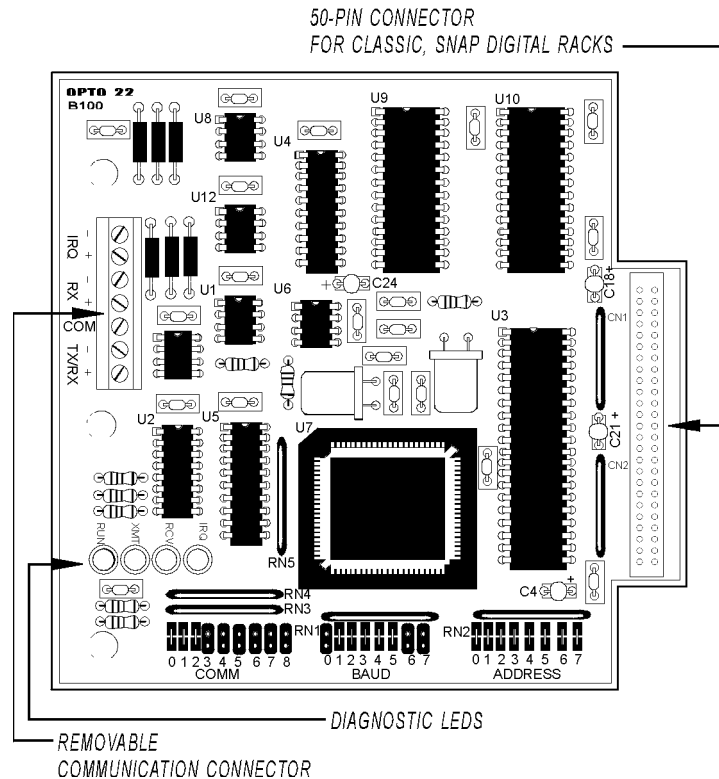
Distributed control functions include event/reactions, latching, pulse train generation, and time delays. Event reactions execute high-speed, deterministic responses to sophisticated control sequences, alarm monitors, or diagnostic conditions.

In addition, the B100 can generate an interrupt signal to an Opto 22 controller or host computer, notifying the controller that an event has occurred.

For systems I/O customers, the B100 can be used with Opto 22's FactoryFloor, the legacy suite of Microsoft® Windows® 32-bit software. FactoryFloor consists of four integrated components:

- OptoControl™, a graphical, flowchart-based development environment for real-time control solutions.
- OptoDisplay™, a graphical, multimedia operator interface package.
- OptoServer™, a robust data server that connects the controller network with the PC-based FactoryFloor network.

The distributed intelligence of the B100 brain board is an integral part of OptoControl.

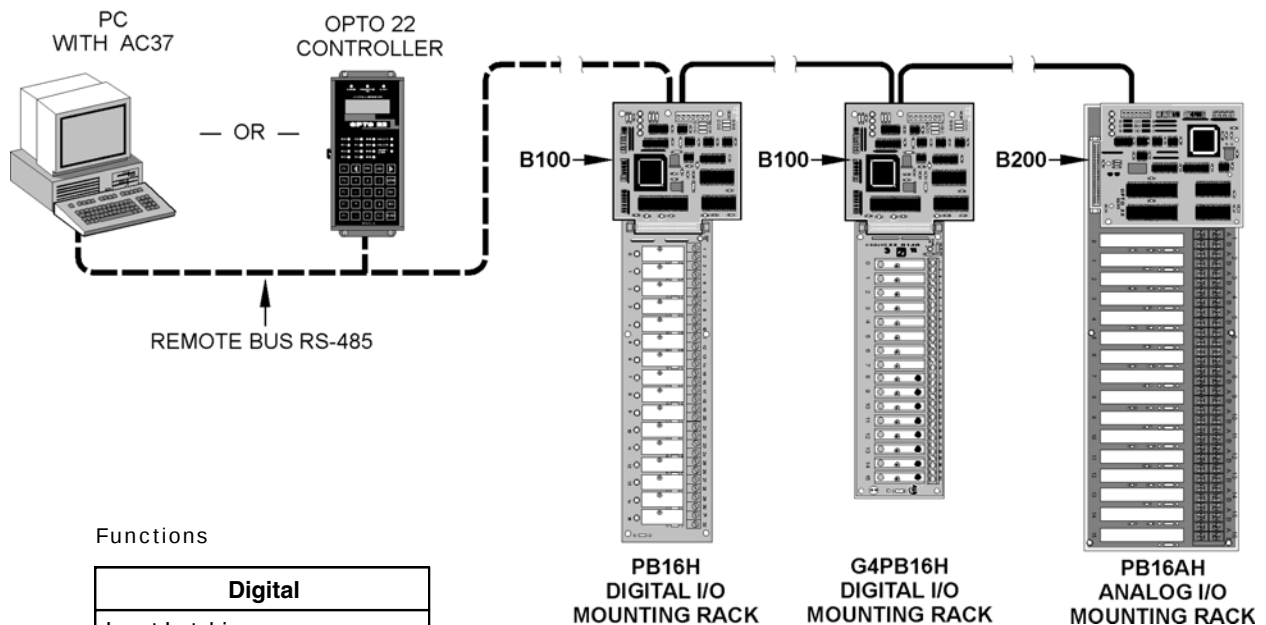


Description (Continued)

In keeping with the OptoOpen Integration™ philosophy, Opto 22's OptoDriver Toolkit™ allows you to create custom solutions utilizing the B100. The OptoDriver toolkit includes 32-bit Windows-compatible drivers, Windows 16-bit drivers, and Opto 22's Classic DOS drivers. The kit also provides the files, documentation, and real-world examples needed to write

Microsoft® Windows and DOS software applications that can access Opto 22 I/O hardware, using languages such as Microsoft Visual C++™ or Microsoft Visual Basic®. The OptoDriver Toolkit provides programmers with a simple, direct connection to Opto 22's industry-standard *mistic*, Optomux, or Pamux® I/O systems.

B100/B200 System Architecture



Functions

Digital
Input Latching
Pulse Duration Measurement (0.1 msec resolution)
Counting (32 bit @ 20kHz)
On/Off Time Totalization
Output Pulse Generation (0.1 msec resolution)
Time Proportional Output (1 msec resolution)

Specifications

MISTIC Command Set - Digital Functions

Digital Setup/System Commands

IDENTIFY TYPE
POWER-UP CLEAR
REPEAT LAST RESPONSE
RESET
RESET ALL PARAMETERS TO DEFAULT
SET COMM LINK WATCHDOG MOMO AND DELAY
SET RESPONSE DELAY
SET SYSTEM OPTIONS

Digital I/O Configuration Commands

READ MODULE CONFIGURATION
SET CHANNEL CONFIGURATION
SET I/O CONFIGURATION - GROUP
STORE CONFIGURATION TO EEPROM

Digital Read/Write, Latch Commands

CLEAR OUTPUT (DEACTIVATE OUTPUT)
READ AND OPTIONALLY CLEAR INPUT LATCHES
READ AND OPTIONALLY CLEAR LATCH
READ MODULE STATUS
SET OUTPUT MODULE STATE - GROUP
SET OUTPUTS (ACTIVATE OUTPUT)

Digital Counter, Frequency Commands

CLEAR COUNTER
ENABLE/DISABLE COUNTER - GROUP
ENABLE/DISABLE COUNTER
READ 16-BIT COUNTER
READ 32-BIT COUNTER - GROUP
READ 32-BIT COUNTER
READ AND CLEAR 16-BIT COUNTER
READ AND CLEAR 32-BIT COUNTER - GROUP
READ AND CLEAR 32-BIT COUNTER
READ COUNTER ENABLE/DISABLE STATUS
READ FREQUENCY MEASUREMENT
READ FREQUENCY MEASUREMENT - GROUP

Digital Time Delay, Pulse Output Commands

GENERATE N PULSES
READ OUTPUT TIMER COUNTER
SET TIME PROPORTIONAL OUTPUT PERIOD
SET TIME PROPORTIONAL OUTPUT PERCENTAGE
START CONTINUOUS SQUARE WAVE
START OFF PULSE
START ON PULSE

Digital Pulse/Period Measurement Commands

READ 16-BIT PULSE/PERIOD MEASUREMENT
READ 32-BIT PULSE/PERIOD - GROUP
READ 32-BIT PULSE/PERIOD MEASUREMENT
READ AND RESTART 16-BIT PULSE/PERIOD
READ AND RESTART 32-BIT PULSE/PERIOD
READ AND RESTART 32-BIT PULSE/PERIOD - GROUP
READ PULSE/PERIOD COMPLETE STATUS

Digital Event/Reaction Commands

CLEAR EVENT/REACTION TABLE
CLEAR EVENT TABLE ENTRY
CLEAR INTERRUPT
ENABLE/DISABLE EVENT ENTRY - GROUP
ENABLE/DISABLE EVENT TABLE ENTRY
READ AND CLEAR EVENT LATCHES
READ EVENT DATA HOLDING BUFFER
READ EVENT ENTRY ENABLE/DISABLE STATUS
READ EVENT LATCHES
READ AND OPTIONALLY CLEAR EVENT LATCH
READ EVENT TABLE ENTRY
SET EVENT INTERRUPT STATUS
SET EVENT ON COMM LINK WATCHDOG TIME-OUT
SET EVENT ON COUNTER/TIMER >=
SET EVENT ON COUNTER/TIMER <=
SET EVENT ON MOMO MATCH
SET EVENT REACTION COMMAND

For detailed information about Mistic Command Set, refer to Mistic Protocol User's Guide (Form #270) or Misticware™ User's Guide (Form #522).

DATA SHEET

page 4/10

Form 729-080610

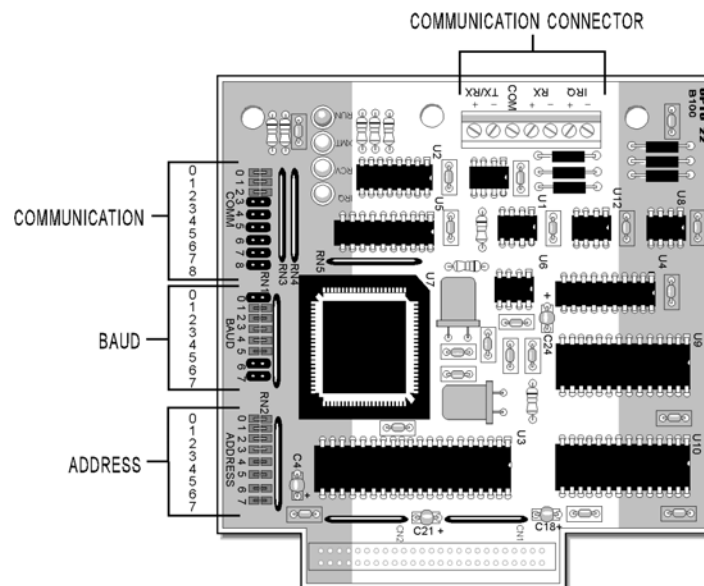
Specifications

General

Operating Specifications

Power Requirements	5.0 VDC $\pm$ 0.1 VDC @ 600 mA max.
Operating Temperature	0° to 70°C, 95% humidity, non-condensing
CPU	16-bit Intel 80C196 I/O processor
Communications Interface	RS-485 twisted pair with shield, 2-wire or 4-wire (if using interrupts)
Data Rates	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, and 115200 baud
Range: Multidrop	Unlimited. (Up to 3,000 feet or 32 stations maximum between repeaters)
Counter and Frequency Measurement	Maximum Rate: 20 kHz Minimum Pulse Width: 10 ms
Output Pulse	Maximum Rate: 500 Hz Minimum Pulse Width: 1 ms
LED Indicators	RUN (Power On), RCV (Receive), XMT (Transmit), and (IRQ) Interrupt
Options: Jumper Selectable	Address, communication, baud rate, CRC/Checksum, Binary/ASCII

Location of Connectors and Jumpers



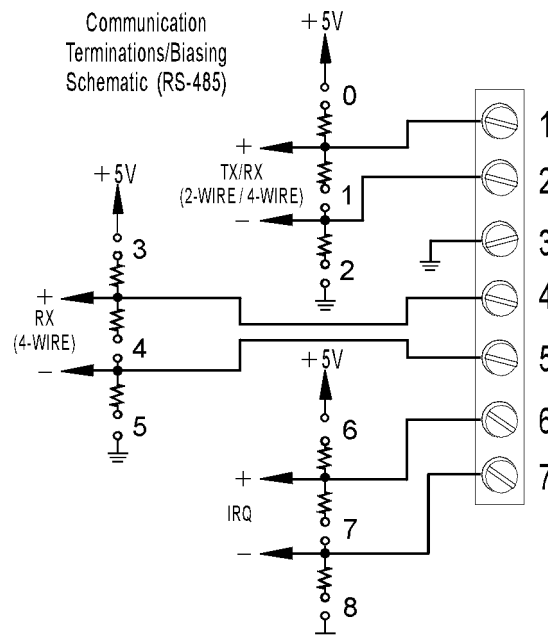
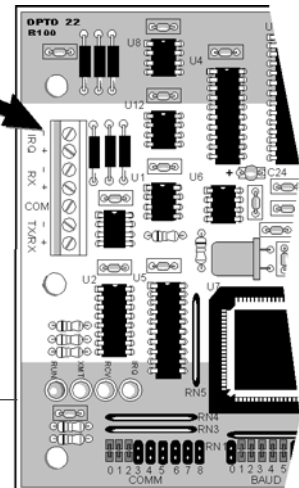
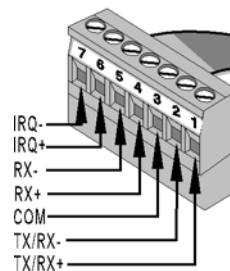
Specifications

LED Descriptions, Communication Jumpers/Wiring

LED Description Table

LED	Description
IRQ	Processor interrupt request currently active.
RCV	Processor is currently receiving data on communication line.
XMT	Processor is currently transmitting data on communication line.
RUN	Power on Processor

Communication Connector Pinout



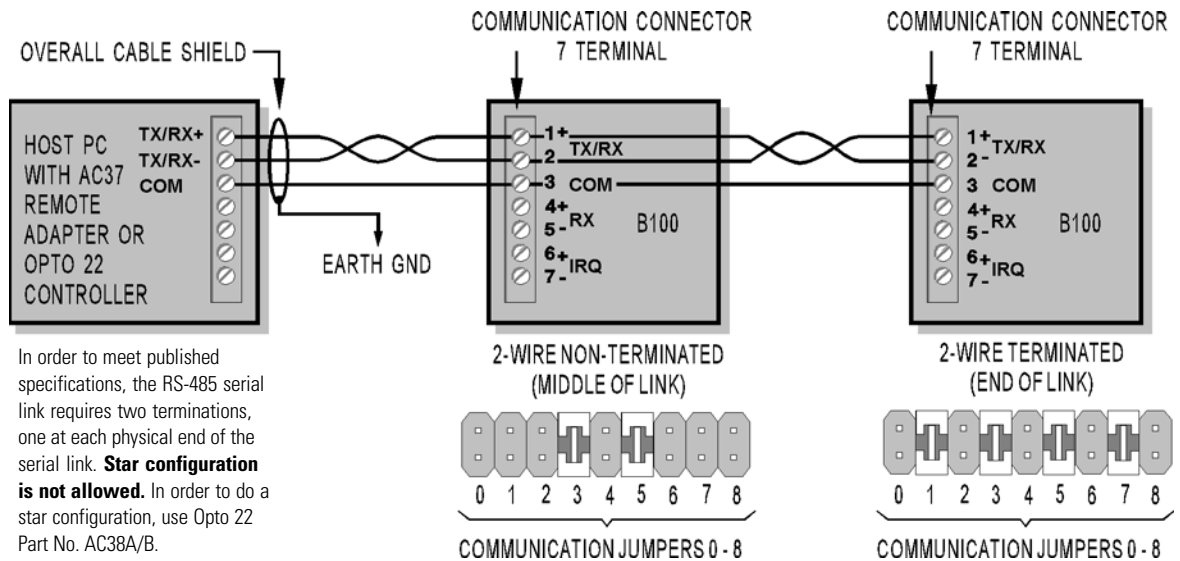
Communication Jumper Descriptions

Jumper	Description
0	Pull-up for TX/RX+
1	Terminator for TX/RX lines
2	Pull-down for TX/RX-
3	Pull-up for RX+
4	Terminator for RX lines
5	Pull-down for RX-
6	Pull-up for IRQ+
7	Terminator for IRQ lines
8	Pull-down for IRQ-

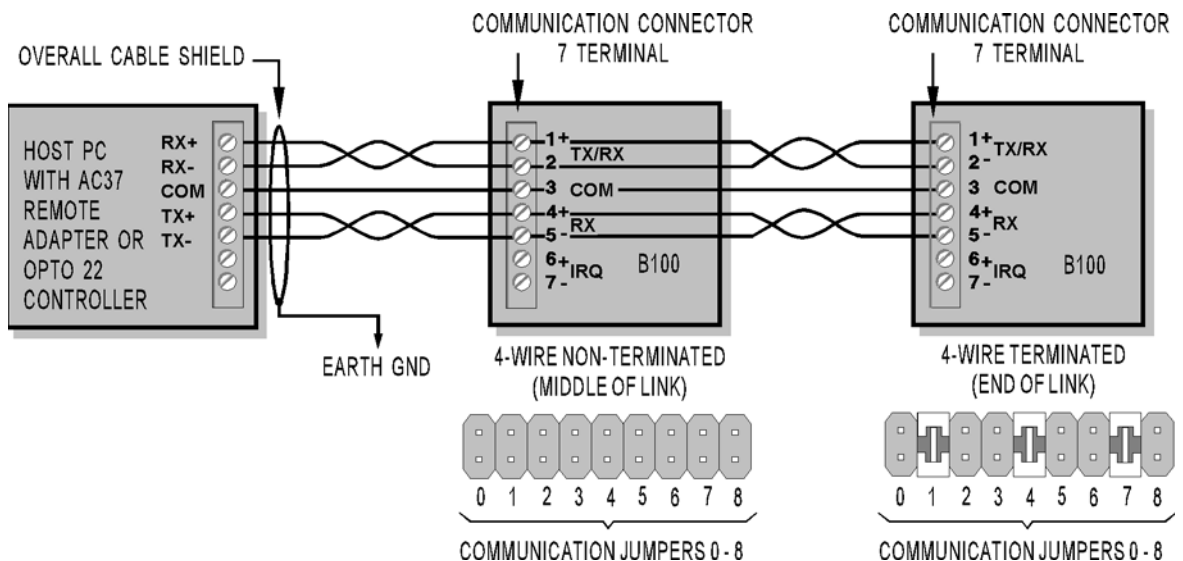
Specifications

Communication Jumpers/Wiring (Continued)

Standard 2-Wire Configuration



Alternate 4-Wire Configuration



Specifications

Baud/Address Jumpers, LED Descriptions

Address Jumpers (ADDRESS 0-7)

Use these jumpers to select an 8-bit address from 0 to 255 (0 to FF hexadecimal). The factory default is 0 (all jumpers out). The most significant bit is 7 and the least significant bit is 0.

7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0	7 6 5 4 3 2 1 0
0	32	64	96	128	160	192	224
1	33	65	97	129	161	193	225
2	34	66	98	130	162	194	226
3	35	67	99	131	163	195	227
4	36	68	100	132	164	196	228
5	37	69	101	133	165	197	229
6	38	70	102	134	166	198	230
7	39	71	103	135	167	199	231
8	40	72	104	136	168	200	232
9	41	73	105	137	169	201	233
10	42	74	106	138	170	202	234
11	43	75	107	139	171	203	235
12	44	76	108	140	172	204	236
13	45	77	109	141	173	205	237
14	46	78	110	142	174	206	238
15	47	79	111	143	175	207	239
16	48	80	112	144	176	208	240
17	49	81	113	145	177	209	241
18	50	82	114	146	178	210	242
19	51	83	115	147	179	211	243
20	52	84	116	148	180	212	244
21	53	85	117	149	181	213	245
22	54	86	118	150	182	214	246
23	55	87	119	151	183	215	247
24	56	88	120	152	184	216	248
25	57	89	121	153	185	217	249
26	58	90	122	154	186	218	250
27	59	91	123	155	187	219	251
28	60	92	124	156	188	220	252
29	61	93	125	157	189	221	253
30	62	94	126	158	190	222	254
31	63	95	127	159	191	223	255

■ = JUMPER INSTALLED □ = NO JUMPER

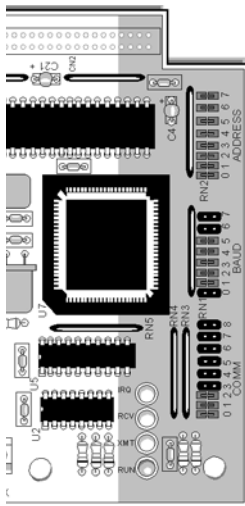


Table 1: Baud Rate Jumpers (0 - 3)

Baud Rate	Jumper Position 0	Jumper Position 1	Jumper Position 2	Jumper Position 3
115.2 KBaud (factory default setting)	Out	In	In	In
76.8 KBaud	In	Out	In	In
57.6 KBaud	Out	Out	In	In
38.4 KBaud	In	In	Out	In
19.2 KBaud	Out	In	Out	In
9600 Baud	In	Out	Out	In
4800 Baud	Out	Out	Out	In
2400 Baud	In	In	In	Out
1200 Baud	Out	In	In	Out
600 Baud	In	Out	In	Out
300 Baud	Out	Out	In	Out

Baud 0 - 3:

Use Table 1 to select appropriate baud rate.

Baud 4: (Mistic mode select jumper):

When using Mistic protocol; used to select either binary mode (jumper in, factory default setting) or ASCII mode (jumper out).

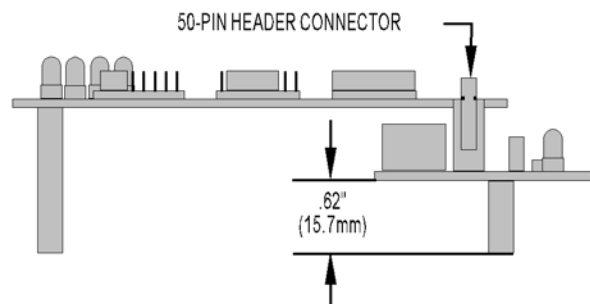
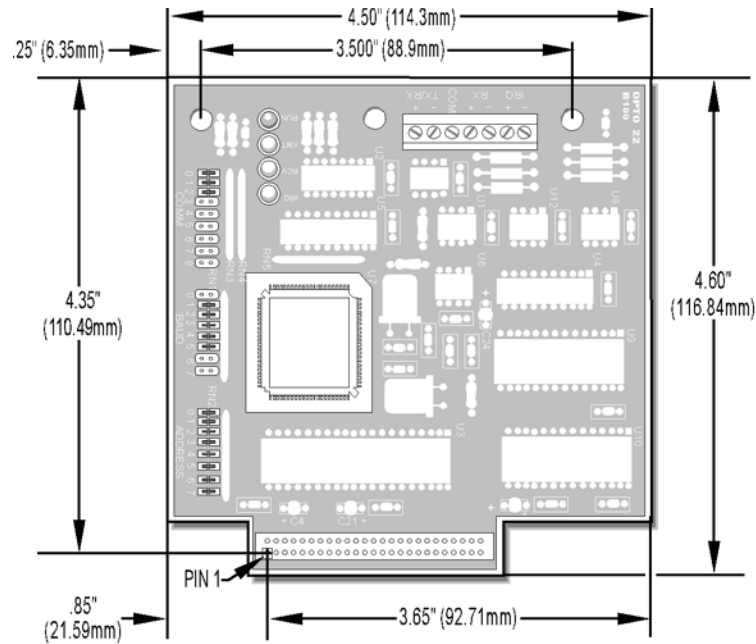
Baud 5: (Data verification jumper):

Used to select whether the type of data verification method used is Checksum Modulo 256 (jumper out) or CRC16 (jumper in, factory default setting).

Baud 6, 7:

Unused.

Dimensional Drawing



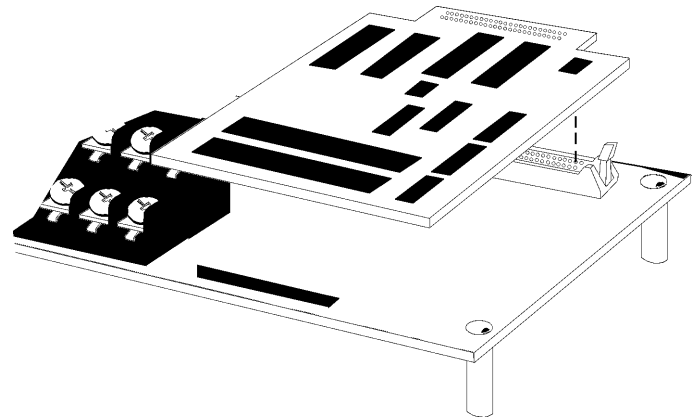
Assembly

Mounting the B100

Installing a B100 onto a Mounting Rack

1. Align the brain board's header connector with the mounting rack's header connector.
2. Firmly press the header connectors together until the locking tabs clamp down on the brain board as shown in Figure 1.

Figure 1



Installing a B100 onto a G4PB16J/K/L Mounting Rack

1. Attach plastic removable standoff to the brain board as shown in Figure 2.
2. Align the brain board's header connector with the mounting rack's header connector and firmly press the header connectors together until the locking tabs clamp down on the brain board as shown in Figure 3.

Figure 2

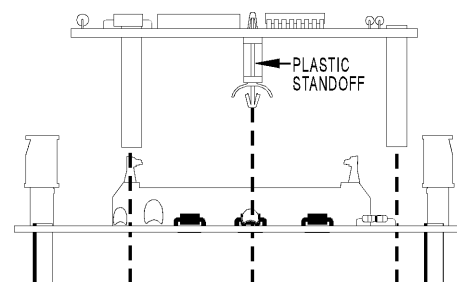
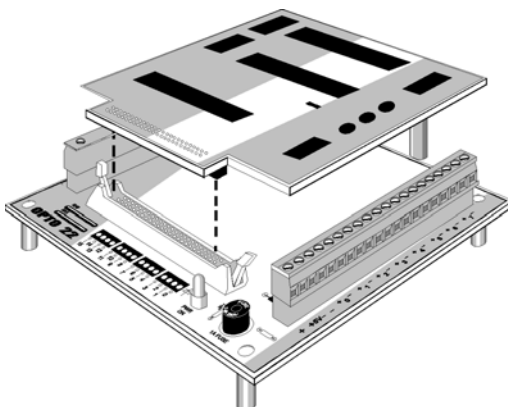


Figure 3



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