

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.

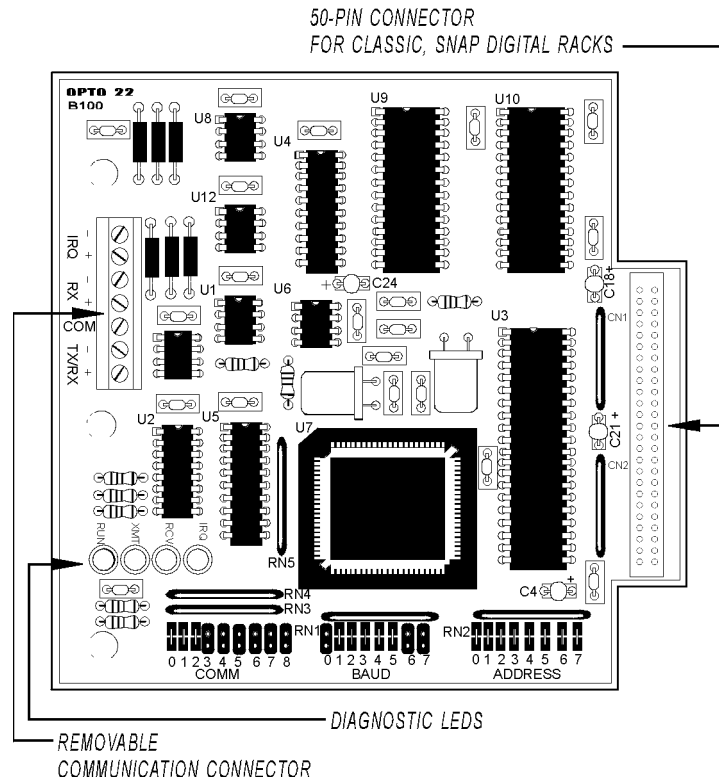
Distributed control functions include event/reactions, latching, pulse train generation, and time delays. Event reactions execute high-speed, deterministic responses to sophisticated control sequences, alarm monitors, or diagnostic conditions.

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.

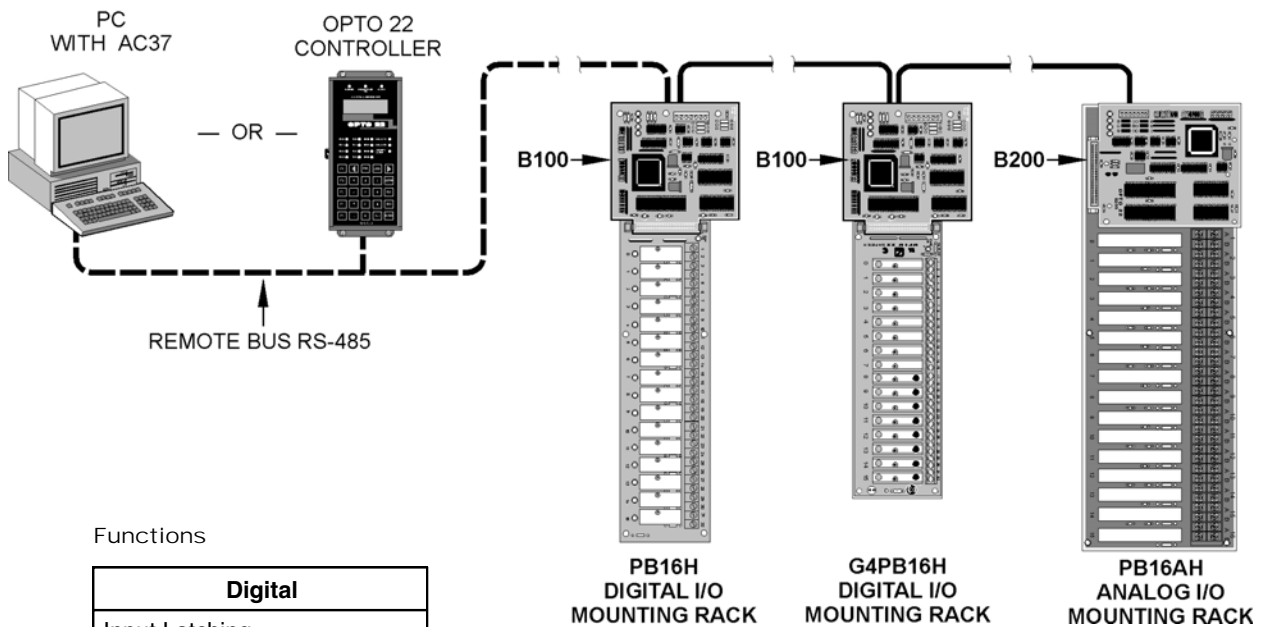


Description (Continued)

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).

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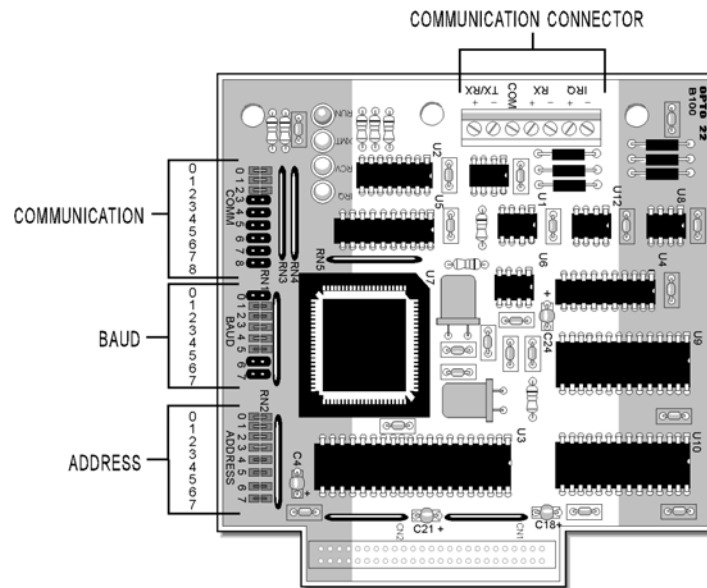
Specifications

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



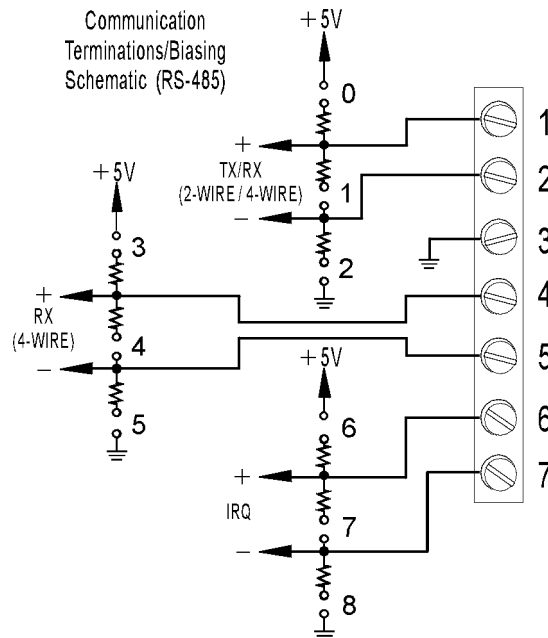
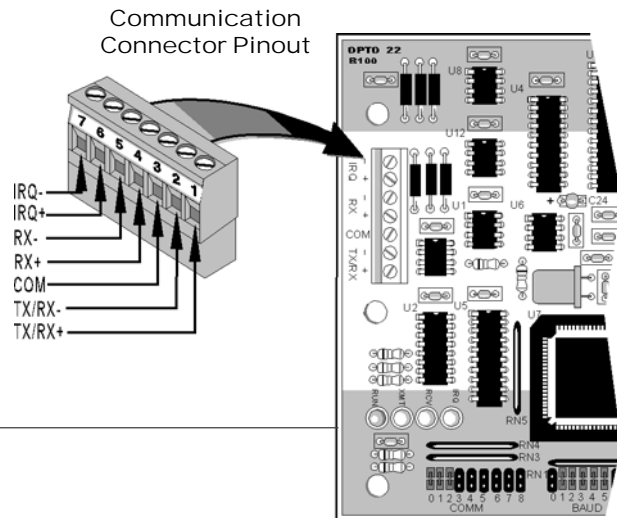
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Specifications

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 Jumper Descriptions

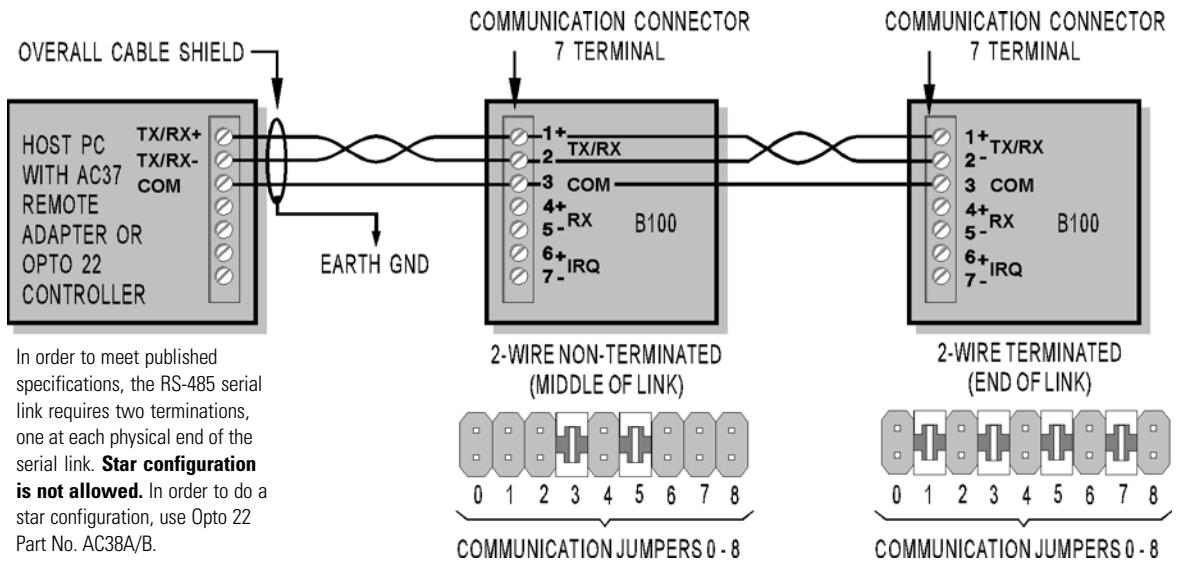
Jumper	Description
0	Pull-up for TX/RX+
1	Terminator for TX/RX lines
2	Pull-down for TX/RX-
3	Pull-up for RX+
4	Terminator for RX lines
5	Pull-down for RX-
6	Pull-up for IRQ+
7	Terminator for IRQ lines
8	Pull-down for IRQ-

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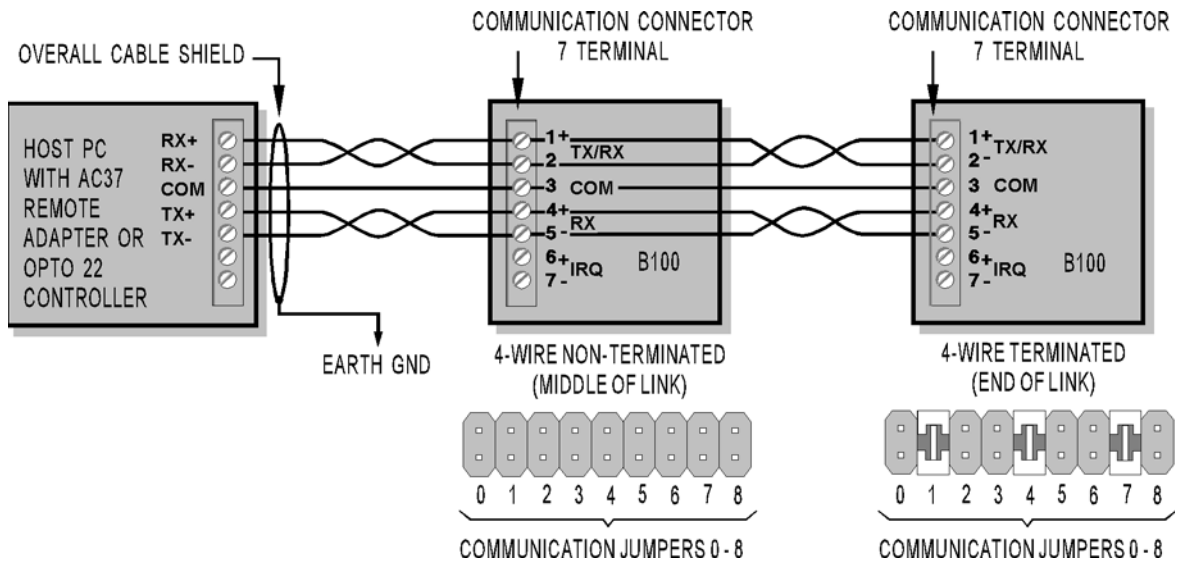
Specifications

Communication Jumpers/Wiring (Continued)

Standard 2-Wire Configuration



Alternate 4-Wire Configuration



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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.

0	XXXXXX	32	000000	64	000000	96	000000	128	000000	160	000000	192	000000	224	000000
1	000000	33	000000	65	000000	97	000000	129	000000	161	000000	193	000000	225	000000
2	000000	34	000000	66	000000	98	000000	130	000000	162	000000	194	000000	226	000000
3	000000	35	000000	67	000000	99	000000	131	000000	163	000000	195	000000	227	000000
4	000000	36	000000	68	000000	100	000000	132	000000	164	000000	196	000000	228	000000
5	000000	37	000000	69	000000	101	000000	133	000000	165	000000	197	000000	229	000000
6	000000	38	000000	70	000000	102	000000	134	000000	166	000000	198	000000	230	000000
7	000000	39	000000	71	000000	103	000000	135	000000	167	000000	199	000000	231	000000
8	000000	40	000000	72	000000	104	000000	136	000000	168	000000	200	000000	232	000000
9	000000	41	000000	73	000000	105	000000	137	000000	169	000000	201	000000	233	000000
10	000000	42	000000	74	000000	106	000000	138	000000	170	000000	202	000000	234	000000
11	000000	43	000000	75	000000	107	000000	139	000000	171	000000	203	000000	235	000000
12	000000	44	000000	76	000000	108	000000	140	000000	172	000000	204	000000	236	000000
13	000000	45	000000	77	000000	109	000000	141	000000	173	000000	205	000000	237	000000
14	000000	46	000000	78	000000	110	000000	142	000000	174	000000	206	000000	238	000000
15	000000	47	000000	79	000000	111	000000	143	000000	175	000000	207	000000	239	000000
16	000000	48	000000	80	000000	112	000000	144	000000	176	000000	208	000000	240	000000
17	000000	49	000000	81	000000	113	000000	145	000000	177	000000	209	000000	241	000000
18	000000	50	000000	82	000000	114	000000	146	000000	178	000000	210	000000	242	000000
19	000000	51	000000	83	000000	115	000000	147	000000	179	000000	211	000000	243	000000
20	000000	52	000000	84	000000	116	000000	148	000000	180	000000	212	000000	244	000000
21	000000	53	000000	85	000000	117	000000	149	000000	181	000000	213	000000	245	000000
22	000000	54	000000	86	000000	118	000000	150	000000	182	000000	214	000000	246	000000
23	000000	55	000000	87	000000	119	000000	151	000000	183	000000	215	000000	247	000000
24	000000	56	000000	88	000000	120	000000	152	000000	184	000000	216	000000	248	000000
25	000000	57	000000	89	000000	121	000000	153	000000	185	000000	217	000000	249	000000
26	000000	58	000000	90	000000	122	000000	154	000000	186	000000	218	000000	250	000000
27	000000	59	000000	91	000000	123	000000	155	000000	187	000000	219	000000	251	000000
28	000000	60	000000	92	000000	124	000000	156	000000	188	000000	220	000000	252	000000
29	000000	61	000000	93	000000	125	000000	157	000000	189	000000	221	000000	253	000000
30	000000	62	000000	94	000000	126	000000	158	000000	190	000000	222	000000	254	000000
31	000000	63	000000	95	000000	127	000000	159	000000	191	000000	223	000000	255	000000

■ = JUMPER INSTALLED □ = NO JUMPER

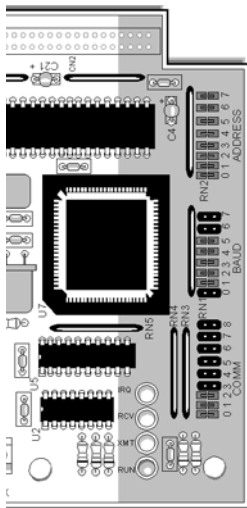


Table 1: Baud Rate Jumpers (0 - 3)

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):

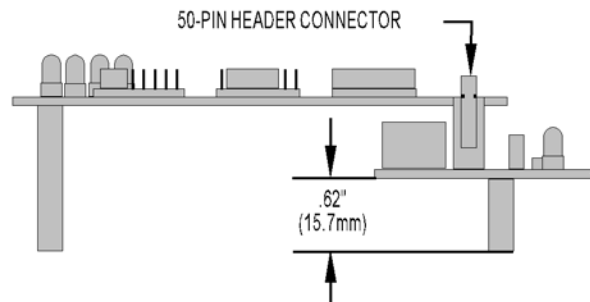
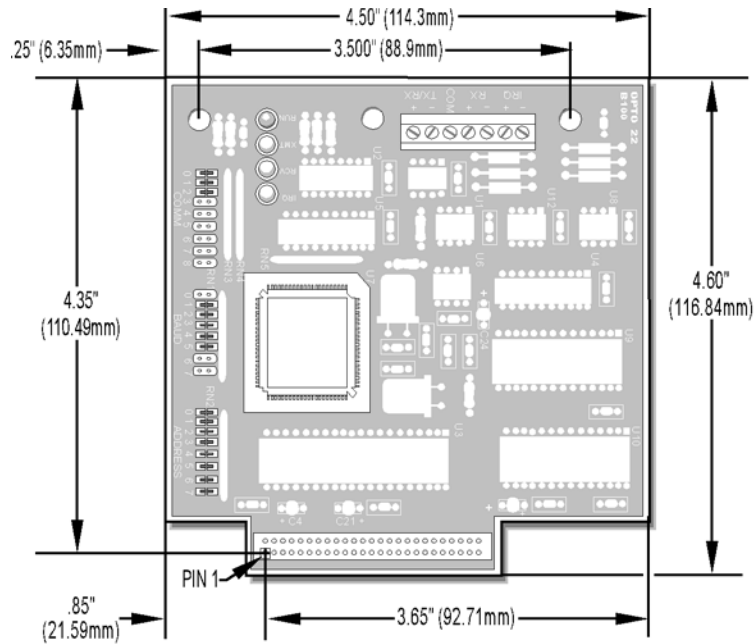
Used to select whether the type of data verification method used is Checksum Modulo 256 (jumper out) or CRC16 (jumper in, factory default setting).

Baud 6, 7:

Unused.

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Dimensional Drawing

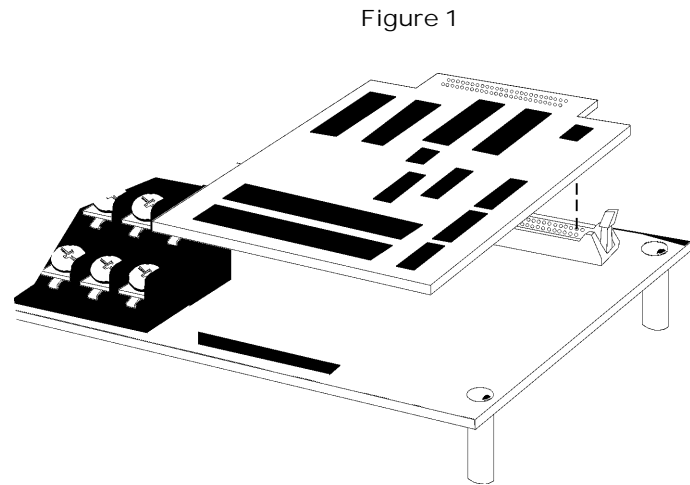


Assembly

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.



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.

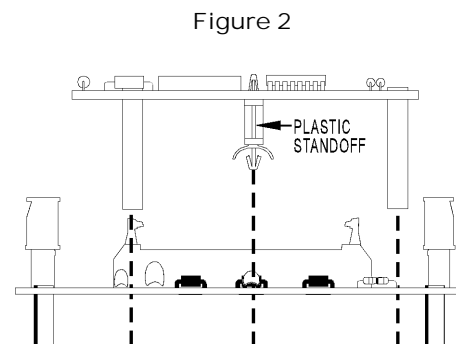
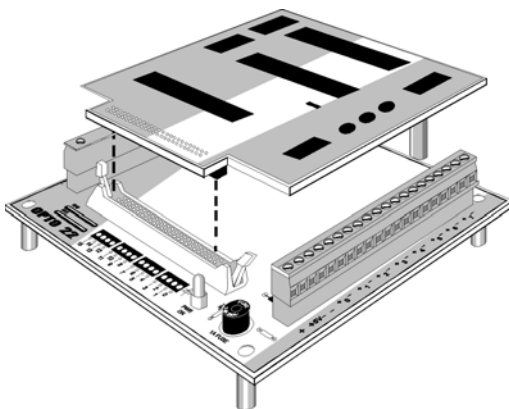


Figure 3



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.

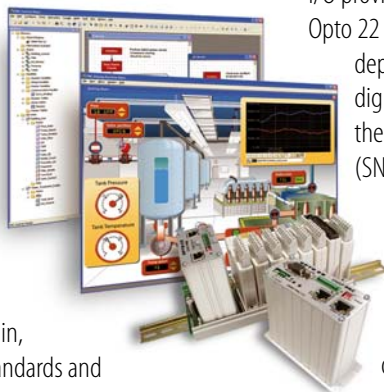
SNAP PACs are based on open Ethernet and Internet Protocol (IP) standards, so you can build or extend a system without the expense and limitations of proprietary networks and protocols.

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.

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