Innovative Solutions in Engineering

BBG-1108b

3-Axis Synchro/Resolver to Serial "SMART" Converter Card

Features

- IBM PC Compatible
- 3-axis Synchro/Resolver Input
- Four NMEA-0183 Compatible Outputs
- RS-232, RS-422, RS-423, RS-485, MIL-STD-188C Protocols
- Stand-alone Mode with Additional +5V Power Supply
- Custom Implementations Available Upon Request

Description

The BBG-1108b is a full-size IBM PC card which accommodates up to three channels of synchro/resolver inputs using industry standard components. Inputs are jumper selectable for synchro or resolver signals and can be configured for any desired voltage by a simple chip/resistor replacement. Synchro or resolver inputs are fused and transient protected.

An onboard microcontroller processes the synchro/resolver information and stores it in dual port memory. This information is available to the host

The processed angular information is, also, available on a 50 pin "D" connector as four channels of NEMA 0183 serial data. This output is available in RS-232, RS-422, RS-423, RS-485, or MIL-STD-188C protocols and is updated at a rate of once per second. Custom serial data formats and frequencies are available upon request.

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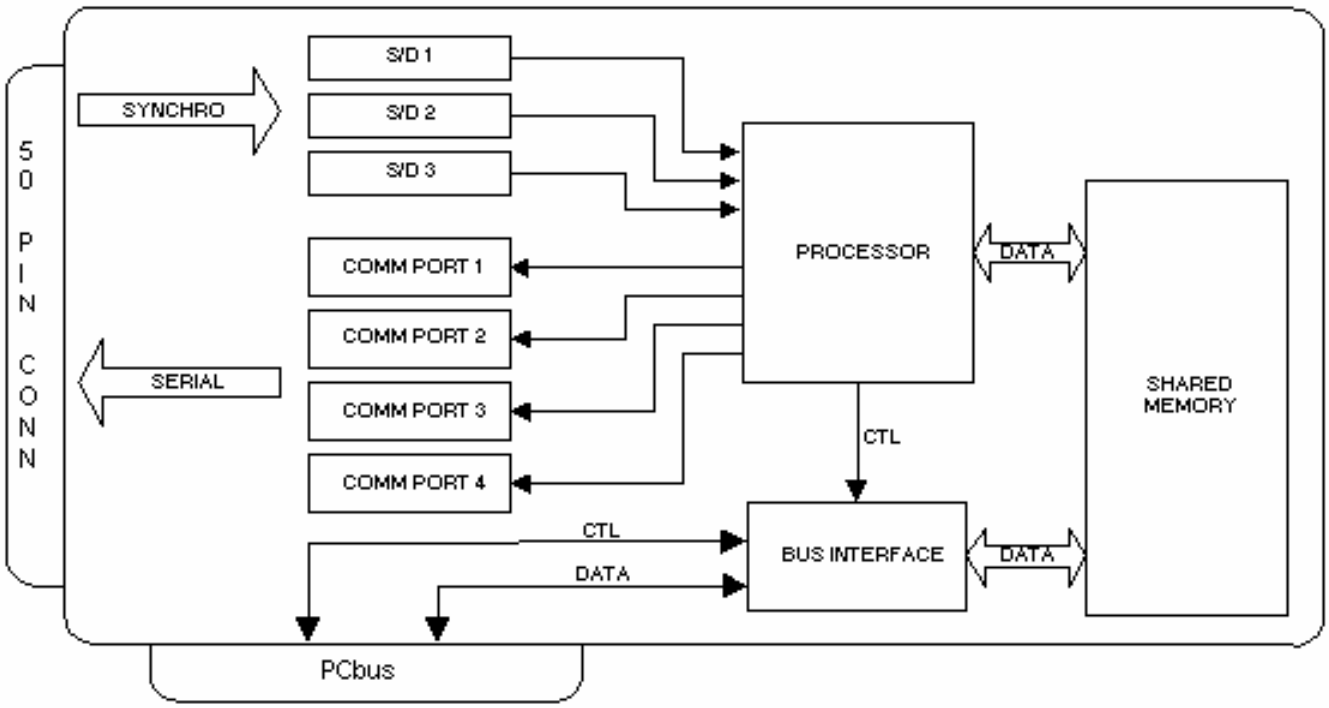
Chart



Technical Specifications

BBG-1108b Specifications		
Power Input	Volts Milliamps	5 ?
Operating Temperature **Storage Temperature**	C° C°	0 to +50 -65 to +150
Physical Characteristics **Full Size IBM PC Card**	Inches Centimeters	4.5 x 13.5 x 0.6 11.4 x 34.3 x 1.5

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Overview

The BBG-1108b is an ISAbus compatible card which interfaces to any slot of an IBM PC or clone. This board supports standard 3-Axis Gyro (synchro) input and converts it into four serial outputs (Roll, Pitch, Heading, and Combined). The BBG-1108b standard message format uses the NMEA 0183 message structures and supports RS-232, RS-422, RS-423, RS-485, and MIL-STD-188C protocols.

The BBG-1108b is a "SMART" interface due to the onboard processor which communicates with the PC bus through shared memory, thus, requiring minimum PC processor time. Synchro/resolver inputs are processed by the onboard processor and stored in shared memory. This information is then read by the PC processor under interrupt control or polled operation. Software drivers included with the BBG-1108b provide easy integration, thus, shortening product development cycle and time to market. DC power is supplied by the PCbus requiring no external power supplies.

In situations not requiring a PC interface, the BBG-1108b operates in a "STAND-ALONE" mode. With the addition of an external +5 volt power supply, the onboard processor converts the synchro/resolver inputs into serial data formats without the requirement of a PC bus. Upon applying power, the BBG-1108b reads the configuration switch, and fully configures and operates with no operator intervention required.

Synchro/resolver signals, reference inputs, and serial outputs are available on a 50 pin male (DB50P) connector.

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BINARY ANGLE MEASUREMENT FORMAT		
BIT	DEG/BIT	MIN/BIT
1 (MSB)	180	10,800
2	90	5,400
3	45	2,700
4	22.5	1,350
5	11.25	675
6	5.625	337.5
7	2.813	168.75
8	1.405	84.38
9	0.7031	42.19
10	0.3516	21.09
11	0.1758	10.55
12	0.0879	5.27
13	0.0439	2.64
14	0.0220	1.32
15	0.0110	0.66
16 (LSB)	0.0055	0.33

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Stand-alone vs. Installed Configuration

The BBG-1108b can, also, be used without a computer in a stand alone mode. During power up or reset, an onboard microcontroller reads the configuration switch, configures the interface card, and provides all signals and control necessary to read the synchro information and output the NMEA 0183 serial messages. Baud rate selection is determined from the configuration switches.

When used in a computer configuration, switches provide for bus address selection and interrupts IRQ2 through IRQ7 are jumper selectable. Baud rates are switch selectable or can programmed via the PC bus. Selectable baud rates include: 1200, 2400, 4800, 9600, and 19,200 bits per second. Default data output is 9600, 8 bits, no parity, and one stop bit (9600, 8, N, 1). The table below defines the switch positions for the available baud rates.

BBG-1108b
Baud Rate Switch Selection

BAUD RATE (bits per sec)	Configuration Switch S1							
	1	2	3	4	5	6	7	8
1200	1	1	0	X	X	X	X	X
2400	0	0	1	X	X	X	X	X
4800	1	0	1	X	X	X	X	X
9600	0	1	1	X	X	X	X	X
19200	1	1	1	X	X	X	X	X

1 = off, 0 = on, X = Don't Care

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Software

Two C programs are included with the BBG-1108b. They are 3axis.c and bamtof.c. The 3axis.c file contains function calls to read each synchro input and returns a floating point angle. These routines use the bamtof.c file to convert the binary angle measurement format to a floating point number. "fRead_cse" reads synchro channel 1, "fRead_roll reads channel 2, and "fRead_pitch reads channel 3. "set_baud_3a" allows changing of the baud rate under computer control.

Selecting an Address

The BBG-1108b uses sixteen (16) I/O addresses. Each converter requires two addresses (high and low byte), the baud rate register requires one address, and the card reset register requires two addresses. The base address of the card is set by switches SW1, SW2, and SW3. SW1 sets address bits 15-12, SW2 sets address bits 11-8, and SW3 sets address bits 7-4. This allows the card to be placed on any 16 bit boundary in I/O space.

Following are examples of switch positions and card addresses. Below the examples is a table that shows the card's I/O map.

Example:

SW1 is set to 0, SW2 is set to 3, and SW3 is set to 0. The address of the card is 300-30F. (Factory Default)

Example:

SW1 is set to 0, SW2 is set to 3, and SW3 is set to 2. The address of the card is 320-32F.

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BBG-1108b I/O Address Map			
Address	**Register**	**Address**	**Register**
XX0	Not Used	XX8	Not Used
XX1	Not Used	XX9	Course Hi
XX2	Not Used	XXA	Course Low
XX3	Not Used	XXB	Roll Hi
XX4	Not Used	XXC	Roll Low
XX5	Not Used	XXD	Pitch Hi
XX6	Set baud	XXE	Pitch Low
XX7	Not Used	XXF	Interrupt Card

NMEA 0183 Format

The BBG-1108b can be factory programmed for any NMEA 0183 data format. Current data format is as follows:
$PTBBG,XXX.XX,YYY.YY,ZZZ.ZZ,A*CSCRLF

```
$     Start of message ascii character 24 Hex
PT    Proprietary message
BBG   BBG Incorporated
XXX.XX  Channel 1 synchro/resolver angle (ex: 045.01)
YYY.YY  Channel 2 synchro/resolver angle (ex: 180.24)
ZZZ.ZZ  Channel 3 synchro/resolver angle (ex: 359.99)
A     Validity (A = valid, V = Invalid)
*     ascii character 2A Hex
CS    Checksum (8 bit XOR of characters between $ and *
CR    Carriage return
LF    Line feed
```

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Optional

Synchro Inputs

The BBG-1108b can be configured for 90Vrms, 11.8Vrms, and/or 6.8Vrms synchro inputs over the frequency range of DC to 40kHz. Custom voltages are available upon request. Please specify desired voltage when ordering card. Figure 1 shows correct connections when using the BBG-1108b in a synchro application. The table below provides jumper configuration information for a synchro application.

BBG-1108b
Synchro Jumper Configuration

Channel 1	P2 1-2	P3 2-3	P4 1-2	P5 1-2	P8 1-2	P9 1-2
Channel 2	P10 1-2	P11 2-3	P12 1-2	P13 1-2	P16 1-2	P17 1-2
Channel 3	P18 1-2	P19 2-3	P20 1-2	P21 1-2	P24 1-2	P25 1-2

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Resolver Inputs

The BBG-1108b can be configured for 90Vrms, 11.8Vrms, and/or 6.8Vrms resolver inputs over the frequency range of DC to 40kHz. Please specify desired voltage when ordering card. Figure 2 and Figure 3 show the correct connections when using the BBG-1108b in a resolver application for differential or single ended signals. The table below provides jumper configuration information for a resolver application.

BBG-1108b
Resolver Jumper Configuration

Channel 1	P2 None	P3 1-2	P4 2-3	P5 2-3	P8 None	P9 2-3
Channel 2	P10 None	P11 1-2	P12 2-3	P13 2-3	P16 None	P17 2-3
Channel 3	P18 None	P19 1-2	P20 2-3	P21 2-3	P24 None	P25 2-3

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CONNECTOR LIST FOR SD-1108b
I/O CONNECTOR TYPE: DD50PA
CONNECTOR MATE: DD50S

Pin No.	Signal	Pin No.	Signal
1	S4_1/+COS_1 (Input)	26	TXDC232 (Output)
2	S3_1/-SIN_1 (Input)	27	RXDC232 (Input)
3	S2_1/-COS_1 (Input)	28	TXDC422+ (Output)
4	S1_1/+SIN_1 (Input)	29	TXDC422- (Output)
5	RH1 (Input)	30	RXDC422+ (Input)
6	RL1 (Input)	31	RXDC422- (Input)
7	S4_2/+COS_2 (Input)	32	+5V*
8	S3_2/-SIN_2 (Input)	33	Ground
9	S2_2/-COS_2 (Input)	34	RH3 (Input)
10	S1_2/+SIN_2 (Input)	35	RL3 (Input)
11	RH2 (Input)	36	Spare
12	RL2 (Input)	37	Ground
13	S4_3/+COS_3 (Input)	38	TXDB232 (Output)
14	S3_3/-SIN_3 (Input)	39	RXDB232 (Input)
15	S2_3/-COS_3 (Input)	40	TXDB422+ (Output)
16	S1_3/+SIN_3 (Input)	41	TXDB422- (Output)
17	Spare	42	RXDB422+ (Input)
18	Ground	43	RXDB422- (Input)
19	TXDD232 (Output)	44	Ground
20	RXDD232 (Input)	45	TXDA232 (Output)
21	TXDD422+ (Output)	46	RXDA232 (Input)
22	TXDD422- (Output)	47	TXDA422+ (Output)
23	RXDD422+ (Input)	48	TXDA422- (Output)
24	RXDD422- (Input)	49	RXDA422+ (Input)
25	Ground	50	RXDA422- (Input)

***Note:** +5V is an output if using standard PCbus computer and an input if using stand alone mode.

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