



## SB214SA Multi-Axis Motion Controller

### Multi-Axis Motion Controller Takes Advantage of Multiprocessor-Distributed Control Architecture



The SB214SA is a stand-alone, multi-axis programmable motion controller powered by a 24VDC input, and can provide two or four axes of control. The controller is software configurable for the following motor types: AC Servo, DC brush and AC Induction motors. Sinusoidal commutation is standard for AC Servo and AC Induction motors.

The SB214SA supports encoder as primary feedback and encoder as secondary feedback or master. Its I/O consists of dedicated safety inputs per axis, dedicated emergency stop, 16 isolated logic inputs, 16 isolated digital outputs, four/six analog inputs and three/five analog outputs (depending on the number of axes).

ACS Motion Control controllers are based on state-of-the-art, proprietary technology that has proven itself in many demanding applications, such as semiconductor assembly and testing, electronic assembly and inspection, digital printing, medical imaging, and packaging. Built-in

capabilities simplify the programming of common applications, such as advanced pick & place, master/slave, and electronic gearing and camming.

The controllers can be programmed to handle motion, time and I/O events. They can operate stand-alone, without a PLC or a PC, and communicate via RS-232/422/485 serial link.

Windows tools are provided for set-up and tuning of the control modules and for developing application programs. Libraries for Microsoft C/C++, Borland C/C++ and Visual Basic are available for DOS, Windows 3.11/95/98/2000/NT. The libraries support multithreading in Windows NT.

Every module is manufactured under an ISO9001 certified quality management system to meet stringent safety and EMC standards, and is CE compliant.

#### Supported Motors:

AC Servo/DC Brushless

DC Brush

Nanomotion Piezo-ceramic

- Fully Programmable Stand-alone and Host-Interfaced Operation
- Powerful I/O Handling with Advanced PLC Capabilities
- 20kHz Sampling Rate
- Advanced Encoder Operation: Control 1-2 Masters and up to 4 Slaves Simultaneously
- Modifiable Servo Algorithms
- Advanced Real-Time Position Event Generator-PEG
- Comprehensive Safety, Diagnostics and Protection
- Interactive Application Development Suite Comprehensive C, C++ and Visual Basic libraries for DOS, Windows 3.x/95/98/2000/NT



## Main Features

### Fully Programmable Standalone and Host-Interfaced Operation:

- Easy to program using ACSPL, a powerful high level language common to all SB-Series control modules
- 32k of user-programmable memory
- General Purpose I/O: 16 inputs and 16 outputs, all opto-isolated
- Four/six (depending on the number of axes) analog inputs that can be used for feedback, such as force and position control
- Three or five (depending on the number of axes) analog outputs for monitoring and auxiliary control functions
- Powerful I/O handling with advanced PLC capabilities
- Teach & go for up to 1,024 points
- Built-in smart joystick interface
- RS-232/422/485 high-speed serial communications interface, up to 57600 baud rate

### Special Features for Demanding Applications:

**Master/Slave:** This mode is characterized by its following accuracy, superimposed move capability, ability to switch “on-the-fly” from slave mode to velocity mode and vice versa through comprehensive software support. This feature has proven itself in challenging applications such as industrial flying shears, coil winding, multi-color printing and high-accuracy scanning and plotting.

**Registration:** This feature allows the destination position of the axis to be changed on-the-fly based on the position of an external sensor captured during a move. The registration moves have a variety of uses including labeling and high-speed printing. The ‘Search-For-Contact’ registration mode is specifically designed for pick and place applications such as wire bonding, die attachment and SMT assembly.

**Position Event Generator (PEG):** The PEG function generates real time, position-triggered output to activate external events based on position. It has a position compare accuracy of +/- 1 count at up to 5 million counts/second, and is designed for such demanding applications as high accuracy laser cutting and automatic optical inspection (AOI) and scanning systems.

**Software Sinusoidal Commutation:** Software sinusoidal commutation for DC brushless (AC servo/synchronous) with a 20kHz update time.

### Outstanding Performance and Capabilities:

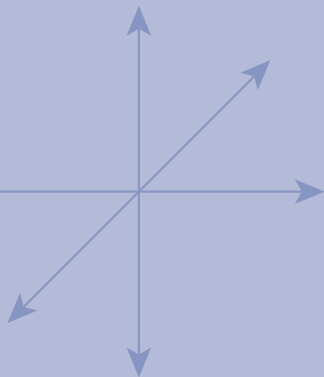
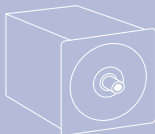
- Fully digital position, velocity at 20kHz sampling rate, for excellent dynamic and tracking performance
- Dual loop capability supports two encoders (per axis), one mounted on the motor and one on the load, for accurate belt-driven and lead-screw based applications

### Comprehensive Safety, Diagnostics, and Protection:

- Programmable automatic routine for each fault, error, and exception
- Real-time data collection of one or two variables, programmable sampling rate up to 1kHz.
- CE marked, meets European safety standard EN60204-1 and EMC standards EN55011 Class A (emission and immunity)

### Powerful Programming and Support Tools:

- ACS Adjuster for Windows: Interactive tool for setting up and tuning
- ACS Debugger for Windows: Development environment for ACSPL applications
- ACS Saver/Loader for Windows: Tool for copying system setup and application data from one controller to another
- ACSLIB C Libraries: Comprehensive C, C++, and Visual Basic libraries for DOS, Windows 3.11/ 95/ 98/ 2000/ NT



# Product Specifications

## Position Control:

**Sampling Rate:** 20kHz

**Control Algorithms:**

Pgain, acceleration feed-forward, automatic velocity feed-forward, anti-reset windup

**Trajectory Calculation Rate:** 1kHz

**Range:**  $\pm 999,999,999$  counts

**Accuracy:**  $\pm 1$  encoder count

**Position Feedback:** Primary encoder per axis, secondary encoder for X or Z and Y or T axis (programmable)

**Position Capture Accuracy:**  $\pm 1$  count at up to 5,000,000 counts/second

**Position Event Generator (PEG™):** Position Compare Accuracy:  $\pm 1$  count at speed up to 5,000,000 counts/second

**Repetition Rate:**

*Random Mode:* 5 events/0.001 second  
*Incremental Mode:* Up to 5MHz

## Velocity Control:

**Sampling Rate:** 20kHz

**Control Algorithm:**

PI + second order low pass filter

**Range:** Up to 128,000,000 counts/second

**Resolution:** 1 count/second

**Velocity Accuracy:**

*Long Term:* 0.005%  
*Short Term:* 0.01% - 0.5% (system-dependent)

**Acceleration Range:**

Up to 2,000,000,000 counts/second<sup>2</sup>

**Acceleration build-up time (Smooth Factor):** 1-255 millisecond

## Position & Velocity Feedback:

**Primary:** Incremental encoder per axis

**Secondary:** Incremental encoder per axis pair (X-Z, Y-T)

**Encoder:** Incremental, 3 channel (A, B, I), differential line drivers, 0-5V, count rate up to 32,000,000 counts/second

**Supply Voltage:** 5V

**Maximum current consumption from onboard supply:** 100mA per encoder (600mA total). Use external supply if higher current is needed

**Dual Loop Capabilities:**

Primary feedback (encoder only) for velocity and commutation; secondary feedback for position

## I/O:

**External I/O Supply:** 5 VDC ( $\pm 10\%$ ) or 24 VDC ( $\pm 20\%$ ), detected automatically

**Safety Inputs:** Left and right limit per axis, E-stop, <1msecond propagation delay

**General Purpose Inputs:** 12 inputs, <1msecond propagation delay

**Fast Inputs (Marks):** 4 inputs, <1 $\mu$ second propagation delay

**Safety, General and Fast Input Type:** Source (can be reconfigured to sink-type), opto-isolated

**General Purpose Outputs:** 16 outputs. 50mA current per output, Maximum total current 700 mA, <1msecond propagation delay, opto-isolated

**PEG Outputs:** Two high-speed differential outputs, <0.2  $\mu$ second propagation delay

**Analog Inputs:** Two single-ended inputs (0-5V), 10-bit resolution; two/four (depending on the number of axes) differential inputs ( $\pm 10V$ ), 12-bit resolution

**Analog Output:** Two/four (depending on the number of axes)  $\pm 10V$  outputs, 10-bit resolution. One general purpose output,  $\pm 10V$ , 8-bit resolution

## Drive Interface:

**Commands:** Two analog (for sinusoidal commutation), differential, non-isolated, per axis,  $\pm 10V$ , 10-bit resolution  
*Maximum Offset:*  $\pm 50mV$ .

**Drive Enable Output:** One per axis  
Type: Open collector/open emitter  
*Collector Emitter Voltage Range:* 5-30 VDC  
*Output Current:* 50mA  
*Propagation Delay:* <1msecond

**Drive Fault Input:** 1 per axis

Type: Source/sink.

**Input Voltage Range (External Supply):** 5 VDC ( $\pm 10\%$ ) or 24 VDC ( $\pm 20\%$ ), Automatic detection, <1msecond propagation delay

## Controller:

**Dual Processor Architecture:**

- 20MHz Intel 80C196KD for high level tasks and management
- 80MHz SB2500 ACS Servo Processor per axis for real-time control tasks

**Memory:**

*Firmware:* 256k

**RAM:** 256k

*Nonvolatile Memory:*

128k, 100,000 write cycles

*User Program Memory:* 32k

## Communications:

**Standard:**

RS232/422/485, up to 57,600 baud rate

## Power Supply:

24VDC ( $\pm 10\%$ ), 1.5A

