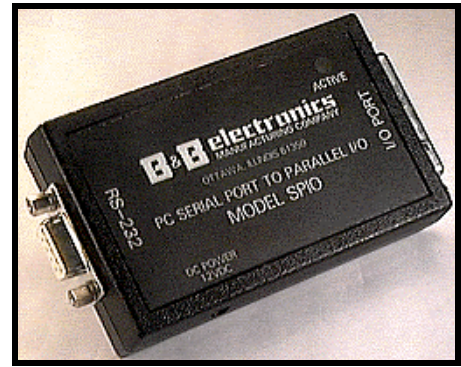


## PC Serial Port to Data Acquisition Control Module

### Model SPIO

The SPIO is a general purpose control module which is connected to your computer's RS-232 Serial Port. Standard baud rates from 300 to 115.2k can be used to match the user's requirements. The SPIO can be used to sense a variety of external conditions and control, via a host computer, a variety of external devices.



I/O lines are available through a female DB-25 connector. Digital input lines are CMOS/TTL compatible. Digital output lines are CMOS compatible. B&B manufactures compatible interfaces for the SPIO. The SDIOB8 is a digital interface board with eight I/O lines. The DAPB1 provides terminal block access to the available I/O lines. The SPIO's communication protocol is a subset of OPTO-22's and I/OPLEXER's protocols. All command messages and replies are transmitted as a series of ASCII characters.

The SPIO module can be configured to use one of two types of communication modes, two-step or four-step. The two-step mode allows for efficient communication between the host and the module while maintaining message integrity due to the message checksum calculation. The four-step mode adds an additional level of security when message integrity is of the utmost importance.

There are no confusing setup switches. All SPIO's configuration parameters are set easily via the host computer. These parameters are then stored in non-volatile memory. This means, the module's setup information is retained even when power is removed from the module. The SPIO provides a setup mode that returns it to known factory defaults if the user configurations are lost.

There is no need to send the SPIO back to B&B for program upgrades. Because the program is stored in EEPROM, all program upgrades can be performed on site by the user.

The SPIO has 8 digital I/O lines that can be defined individually by the user as inputs or as outputs. Normal inputs can be used to sense switch closures, contact closures or the state of digital signals. Normal input lines can also be used to sense AC voltages by using solid state relays that are available from many manufacturers. Input lines can be configured by the user as latches. I/O's #0,1 can be configured by the user as a software controlled event counter. I/O's #0,1 with I/O's #4,5 can be configured by the user as externally controlled event counters. Both types of event counters can count up to 540k HZ.

Digital outputs are used by the host to turn on and off external devices. The outputs contain an open-collector transistor that can drive electro-mechanical relays, solid state relays, CMOS and TTL logic circuits. Output lines can be configured by the user as delayed ON/OFF outputs with a time delay range from 10ms - 10.92 minutes. I/O #3 on the SPIO can be configured by the user as a Pulse Width Modulation (PWM) generator. The PWM can be operated in two modes. The high speed mode has an 8-bit resolution of 0.27 microseconds per bit and a fixed cycle of 69 microseconds. The high resolution mode has a 16-bit resolution of 0.27 microseconds per bit and a fixed cycle of 17.78 milliseconds.

The SPIO contains an 8-bit Analog to Digital (A/D) converter and an 8-bit Digital to Analog (D/A) converter. The D/A converter has two channels, a common ground, and operates with positive voltages. The A/D converter has eight channels, a common ground, and operates with positive voltages. The A/D converters are successive approximation types with 8-bit resolution. They have absolute precision of +/- 3 least significant bits with a conversion speed of 26.9 micro-seconds. The D/A converter is an R-2R resistive ladder type with 8-bit resolution. The D/A output voltage corresponds to the 8-bit hex number written to the D/A channel with respect to the D/A REF voltage. The D/A outputs can only drive a small amount of current so an external buffer amplifier may be required.

The SPIO has a red LED labeled "ACTIVE" that blinks at a 1 second rate indicating the module is operating properly. The LED will stop blinking when a fault occurs.

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When the SPIO module initially has power applied to it, all output lines will be set to a predefined power up level. This will happen anytime the SPIO experiences a power loss and power is then reapplied. This feature allows the user to define a level for each output that will leave the system in a safe operating condition at power up.

The SPIO package comes with a user's manual and a diskette. The diskette contains an application programming interface (API) in the assembly language. The API can be linked into the following programming languages to give you access to the SPIO: QuickBASIC, PASCAL, and C. Demonstration programs show how to access the module using the API. The source code is provided for these programs. A configuration program allows an easy way to configure the SPIO module to fit your systems requirements. A monitor program lets you interact with the SPIO. This can be very helpful when installing modules into your system. An update program is provided that allows the user to update the SPIO firmware on site when upgrades become available. This feature greatly reduces system down time and provides the user with an easy way to upgrade the SPIO with the latest firmware.

## SPIO SPECIFICATIONS

Size: 3.8"L x 2.4"W x 0.9"H  
 Power Requirement: 10 - 18 vdc @ 50 ma.  
 Operating Temperature: 0 to +70 degrees C.

### Digital I/O: 8 Lines Programmable as Inputs or Outputs

Digital I/O Used as Input:

Input Voltage: 0 to +5 vdc  
 "0" Input Voltage: +2.0 to +5.0 vdc  
 "1" Input Voltage: 0 to +0.8 vdc

Digital I/O Used as Output:

Output Voltage: +5 vdc max.  
 Output Current: 10 ma max. per output.

**CAUTION:** Total digital output power cannot exceed 0.5 watts!

### Analog I/O: 2 D/A Outputs and 8 A/D Inputs

A/D Inputs:

Resolution: 8 bits  
 Absolute Accuracy: +/- 3 LSB max. (+/- 1.5 LSB typ.)  
 A/D Input Voltage: ANALOG GND to A/D PWR  
 A/D REF Voltage: +2 vdc min. to +5.5 vdc max.  
 A/D PWR Voltage: +4.5 vdc min. to +5.5 vdc max.

D/A Outputs:

Resolution: 8 bits  
 Output Resistance: 1K min, 2K typ, 4K max  
 D/A REF Voltage: +4 vdc min to +5.5 vdc max  
 REF Input Current: 2.5 ma typ. 5 ma max.  
 Full Scale Deviation: 1% max. @+5 vdc D/A REF

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INTERFACING SPIO WITH ISOLATED DIGITAL I/O MODULES

