

SB022
Quick Start Guide



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Scon SB Products Description

Scon SB products are small microcontroller based PC boards specifically designed to drive RC type servos for robotic applications. Scon SBs have PWM drivers, a generous flash memory space for program storage and may have other inputs and outputs for non-servo devices. For programming, setup and download, these products use PSccon, a Windows based program supplied with the controller. The Scon SB is designed to run as an independent controller, however while connected to a PC, PSccon can control all aspects the Scon SB. The products connection is via the PC's USB port.

Hardware:

Scon SB products are designed to be powered by batteries and require as little as 5.5 volts DC. The controller has a 3 position terminal block with one connection for the controller power, one for common, and one for the servo power. This allows separate power for servos and for the controller. The controller power and servo power connections may be tied together and powered from a single source if it is of sufficient in capacity. Large high power servos and fast digital servos require substantial short term current. In those cases, separate servo power is recommended. The controller can be powered from the USB port while connected to a PC. This is done using the jumper "A". Placing the jumper block between the center and the post near the terminal strip powers the controller from the terminal. Placing the jumper block between the center post and the post nearest the USB connector powers the controller from the USB port. Note the servos may **not** be powered using this option and require their own power source. Refer to the board connection diagram for further information.

The servo connectors are standard three pin with .1 inch spacing arranged with the ground (common) on the outside of the PC board; center is the power pin; and the pulse pin on the inside. SB products generate standard RC PWM servo pulses of 5 volts and a pulse width of between 0 and 6.5 milliseconds, specified in .1 microsecond units, accuracy is better than 1/2 microsecond.

Non-servo inputs and outputs are addressed in the Scon language starting with input 1 and output 1. SB Devices may have none or several inputs and outputs. Inputs on a three input Scon SB product will be inputs 1, 2 and 3. Scon language supports 254 inputs and 254 outputs. "Output 1 on" will turn output 1 on; "Output 1 off" will turn it off. "Output 15 on" will enable the onboard LED in Scon SB's. Download the long manual for an explanation of the Flex I/O operation.

Functional operation

SB products are designed to run SconScript, a basic like script language designed for controlling standard RC pulse type servos. SconScript programs are written and edited using a text editor such as notepad. PSccon is then used to convert the text into the required format, and download it to the Scon SB board. Once the program is downloaded, the SB board can run the program without connection to the PC.

The SB 022 product's processor stores setup and communication information. SconScript programs are stored on a separate flash memory chip located on the board. This chip contains at least 4 megabits of memory that is divided into pages. Each page contains a block of 16 byte locations referred to as elements, there are 16 elements on each 256 byte page. An element is the primary storage arrangement for SconScript. All stored position, Speed reference, and instructions occupy one element. SconScript scans through the instruction elements, processing them in sequence. When your SconScript program is run, SconScript will start at element 0 unless you provide a different starting element address. If starting by pushbutton, start on power-up or start by IO pin activation, the program will start at element 0. If you would like to start elsewhere simply place a goto instruction at element 0.

For further programming information refer to the documentation available at www.sconcon.com.

Using PSccon:

Once started PSccon offers a lot of features to control the SB board and your SconScript program. The main controls on the startup screen control run, stop and pause. These are self-explanatory. By default settings, the Scon board will send the status information such as line number and program status on a continuous basis. If this function is disabled, the monitor status button re-activates the function. The refresh status button requests a single status event. Selecting "Setup and Tools" from the menu then "System Setup" activates the system setup screen. This is the PSccon setup screen and is used to control directories, ports and other items related to PSccon. Select Com port 0 for the normal setting, this will cause PSccon to look on all ports for the board.

Selecting “Setup and Tools” from the menu then “Board Setup” activates the board setup screen. Set the servos you intend to use to active. Selecting hardware control causes input #1 to start the program and input#2 to stop the program. Run on Powerup is self explanatory; if Push Button control is selected, the on board pushbutton will toggle the board between run and stop. The “Pulse Width Limits” section limits the minimum and maximum pulse width that the board will generate. This is to protect the hardware and servos. Select the “Use limit controls” box to enable pulse limits. The values are in 10,000 microsecond units. Recommended defaults are 22500 (2.25 Milliseconds) for maximum and 9000 (.9 Milliseconds) for minimum. The same pulse limits apply to all servos.

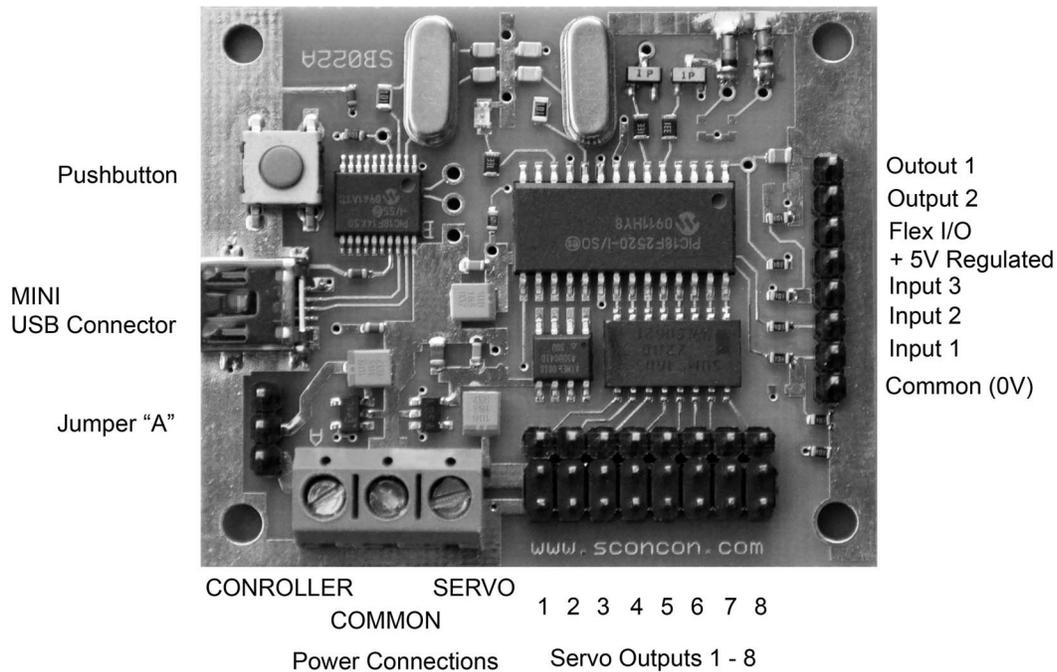
Once all parameters have been set, click “Store Parameters”, this will store the values into the board processors eeprom memory. At this point, the board continues to run with the old values. Clicking the “Reload from EEPROM” button will reset the board and load the new values.

Flash memory

When a Scon file is downloaded, the onboard flash memory is overwritten with the new data; only the elements that are used in the new program will be written to. This allows downloading small sections while leaving blocks of subroutines in memory. This is desirable due to the required flash load time on large programs. It also allows commonly used subroutines to be left as part of the program. The entire flash memory may be erased if desired using the Flash tools utility describe below.

The “Flash tools” utility also allows reading and writing the SB’s flash memory. For reading, a page address range must be selected. Each page contains 16 elements. The entire range of pages (0-2047) may be selected; however reading the entire flash memory may take several minutes. Writing will take longer due to the flash memory write cycle. The flash file name is listed on the “Flash tools” utility screen. Scon flash file format specifies a page address for each page to be written and only what is read into the file will be written back into Scon with a flash write. This tool can be used for reading and writing positional data blocks or “cloning” Scon modules. Clicking the **Read & List as Lines** button will list the data one element per line.

RESET TO DEFAULTS NOTE: If memory value become damaged or corrupted or changed inadvertently the Scon board product may be reset to factory default functions. This is accomplished by holding down the on-board pushbutton while the board is powered up. This does not erase the SconScript program, use the Flash Tools dropdown to erase the flash memory.



Running PScon and the controller the first time

PScon version 2.01+ will scan the computer's ports looking for the SB022 board. The USB engine on the board is powered by the connected computer through the USB cable, however the processor on the SB can be powered by the USB cable or by the battery supply. The servos cannot be powered by the USB cable due to the high power requirement. To make the first run of the system as simple as possible, it is recommended that the SB022 be powered by the USB cable until the user is familiar with the board and PScon. The recommended procedure is as follows:

1. Make sure the "A" jumper (see photo) is installed between the center post and the post nearest the USB connector. This connects the SB022 processor to the USB cable. Plug the USB cable in and follow the instructions in "*Scon Pscon V2.0X Windows Driver Setup - USB Devices Only*" section of this manual. Once completed, unload PScon, disconnect the board and continue below.
2. Using the USB cable, plug the SB022 into the computer. Start PScon, it will scan for the port and report the port number and module version in the box at the bottom of the screen if the USB installation was successful.
3. Test the board by clicking "Setup and Tools" then "Send Command" then click "Request Version". The version will display, this is the firmware version sent by the board and confirms that the connection has been totally successful.
4. Connect a battery source for the servos. 4 AA cells are recommended for an easy way to get started. The negative (-) lead is usually black and should be connected to the center screw terminal. The positive (+) lead is usually red and should be connected to the screw terminal nearest the servo connections (see photo).
5. Leave jumper A in its current position if you intend to run the board connected to the computer.
6. To run the board from batteries, move the jumper A to connect the center post with the post nearest the terminal block. Connect the battery negative (-) lead is (usually black) to the center screw terminal. The positive (+) lead is usually red and should be connected to the screw terminal nearest the A jumper (see photo).
7. The board will now run from the connected batteries. When you need to connect the board to the USB for setup or program download, connect the battery power before connecting the USB cable to the computer. This is necessary because Windows drops the USB connection each time the board is disconnected and PScon must re-establish this connection after windows has restarted the USB driver.

Scon Pscon V2.0X Windows Driver Setup - USB Devices Only

The driver(s) for Scon SB022 is on the WinDriver directory in the PScon install disc and also copied into the C:/Program Files/PScon/WinDriver directory on the PC during a normal PScon (V2.0+) install. The driver enumerates as a virtual serial port into Windows XP, Vista and Windows 7. Setting the system up varies slightly between windows versions and on the updates that have been installed on the PC.

The recommended procedure for all three Windows Versions is as follows:

1. Install PScon using the disc or zip file online (recommended) by clicking the setup icon. Do not run PScon at this time.

2. Plug in the PScon module via the USB port that you intend to use. Windows will report that it needs a driver for the hardware. Note: Windows will remember which port (USB connector) used and will enumerate the driver with a separate virtual port number for each USB connector on the PC that is used.

3A. Windows asks to Connect to Windows Update to locate the driver Click **No, not this time**.

3B. Windows asks for a driver. Click **Install from a list of specific location (Advanced)** then **Next**.

3C. Click **Include this location in the search**; browse to **C:/Program Files/PScon/WinDriver**. Click **Next**.

3D. Windows will open a Hardware Installation window and report a warning that the software has not passed the Windows Logo testing. Click **Continue Anyway**. Windows installs the driver. Click **Finish**.

Launch PScon. PScon .Version 2.0 and up will automatically locate the Scon board if it is connected and powered when PScon is started. If the driver install was successful and PScon cannot locate the connected and powered board the port number may be out of range. In that case proceed to 3E.

3E. Locate and Right click My Computer, Right click Properties then Hardware then Device Manager.

3F. Locate and open Ports (COM & LPT). Make sure the board is connected; look on the list for a Communications Port (Com ..). One of these is the SB022. Right Click and select Properties on each one until you locate "Scon Technologies" & Scon Module Series 24) driver. If the Port number is 15 or less, you are finished with setup; note this port number and launch PScon. If the port number is above 15, Continue below at 3G.

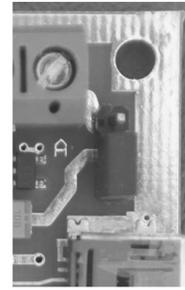
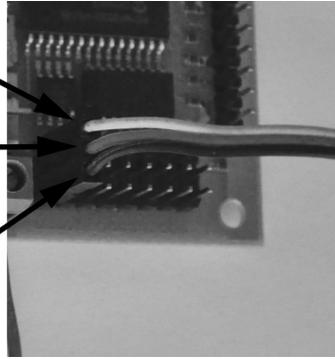
3G. Changing the port number. Windows now allows a substantial number of virtual ports. PScon V2.0+ does not support port numbers over 15. When Windows assigns a port number, it stores that port for use even if the device is no longer present. For this reason it is possible to have a long list of un-used ports. If this is the case the USB driver may enumerate a port above 15. To correct this, you must change the virtual port number.

Locate and Right click My Computer, Right click **Properties** then **Hardware** then **Device Manager**. Right click **Properties** for the port located in section 3F above. Click the **Port Settings** tab then click **Advanced**. In the drop down box, select an available port number that is less than 15. Each time you connect a device using a virtual port, an additional different USB port will be assigned, regardless of the previous assignment. For this reason, many ports that are listed as in use are not actually being used. You may need to re-assign a port listed as "in use".

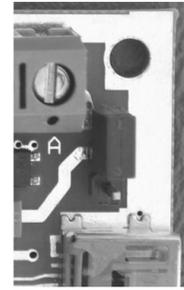
Signal Lead (Often white, yellow black)

Power Lead - Center (Often Red)

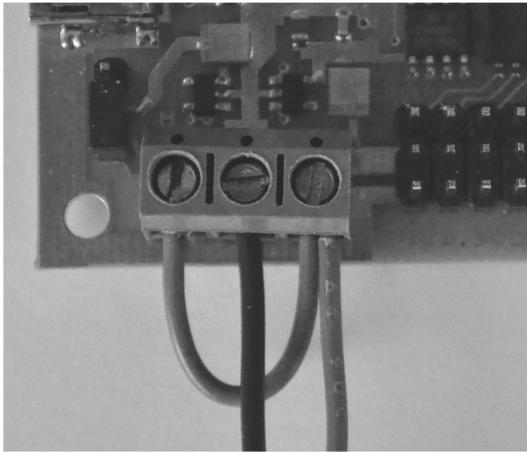
Negative - Common Lead (Often Black)



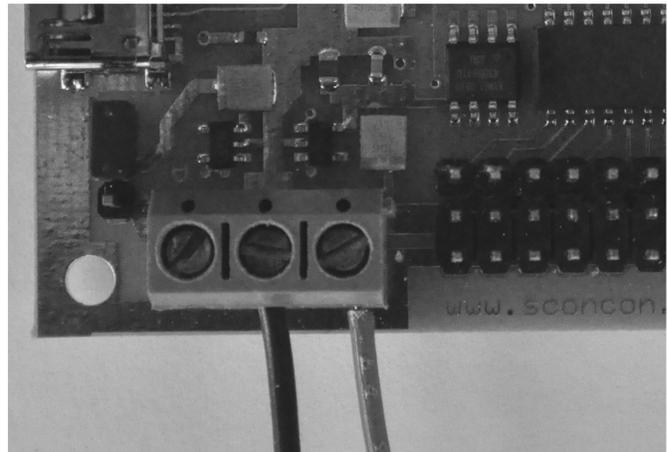
Jumper A set for USB power



Jumper A set for Terminal power



Jumper and wiring shown for battery power Servo and controller same source. Center is Negative



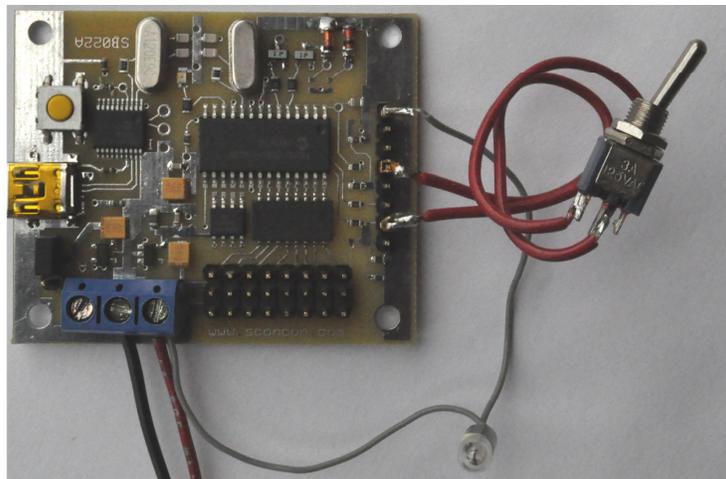
Jumper set so that controller is powered from USB cable Servos powered by battery. Center is Negative

Example: Output #1 is connected to a small lamp powered by the un-regulated servo power supply. Outputs 1 and 2 are open collector transistors with zenar diode protection. Current draw should be limited to 200MA. Output #1 is on pin #8.

Example: Input #1 is connected to a small switch. Terminal pin 2 is input 1. Inputs 1, 2 and 3 have 10K ohm pull down resisors and if left open will be in the 0V off state. Pin 5 is regulated 5 Volts out and is used as a source to pull input #1 up when the switch is closed.

The board is set with jumper A installed so that the board is powered from the USB cable.

The servos cannot be powered from the USB cable and must have their own power source connected to the terminal as shown.



Trouble shooting and other information

Install and USB information:

PScon normally installs in C:\Program files\PScon. Additionally, PScon requires one directory (C:\irunner) for data files. The directory will be created automatically when PScon runs the first time.

Read the USB driver setup section carefully. Each time the device is disconnected from the PC, the USB driver is unloaded and PScon loses connection. PScon cannot re-connect without re-starting so you must exit PScon and restart it if the Scon board is disconnected and re-connected.

Program Run Errors / Issues:

PScon does not list all errors. If the program does not work as expected check the Scon program carefully. The converter generates a listing file that you can view to confirm your program. This file is called list.txt and may be opened with any text editor. Errors such as missing labels and unidentified lines will be listed there.

Stack underflow or overflow errors can be caused by a misspelled “goto”, “call” or “return” keyword or by calling or looping more than the supported stack memory allows.

Standard Specifications Table - SCON SB022

Power	5.5-12 VDC, 100 ma, plus servo requirements
Outputs	8 pwm 1 - 6,400 microseconds (.001 – 6.4 Milliseconds) specified to .1 microseconds
Outputs	Not present on all devices – 2 open collector 200ma zener protected 16V max
Inputs	Not present on all devices – 3 DC input 10K load 5 Volt
Flex I/O	Not present on all devices – 1 Configurable as 5VDC input or 5 Volt 20ma output
Accuracy	PWM pulses better than ½ microsecond
Firmware	SconScript interpreter
Memory	512K Bytes off processor Scon language program storage for 32,000 16 byte Elements
Interface	USB mini B connector for connection to a standard PC
Connectors	.1” spacing 3-square pin standard RC servo format

Scon SB devices designations “M” indicates minimum configuration with 8 Servo outputs and computer connectivity. “S” indicates standard configuration with additional I/O installed on the board. SB022S will have 2 Open collector outputs and 3 digital inputs and one direct connection that can be configured as an input or output (Flex I/O). The Scon SB digital input and output routines are included in most firmware, however hardware drivers and input buffers are not present on the products. These surface mount components may be populated from the SB schematic available online if desired.

Scon SB022 is a USB connectivity device. USB mini B type connector is the standard computer interface. Products SB017-SB021 are serial port devices that may also be interconnected with processor modules.

Scon SB’s generate very accurate industry-standard positive going servo pulses and are ideal for robotic applications and servo testing.

High servo load conditions may require a separate servo power source. If desired, a 9V battery may be used to power the Scon board if the servo power is separate. For most applications, a single 6 Volt battery or 4 AA batteries are used and the servo and logic power can be tied together and run with a strong single battery.

For Further information please consult the online documentation or the install CD.

The latest version of PScon is available for download online.

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