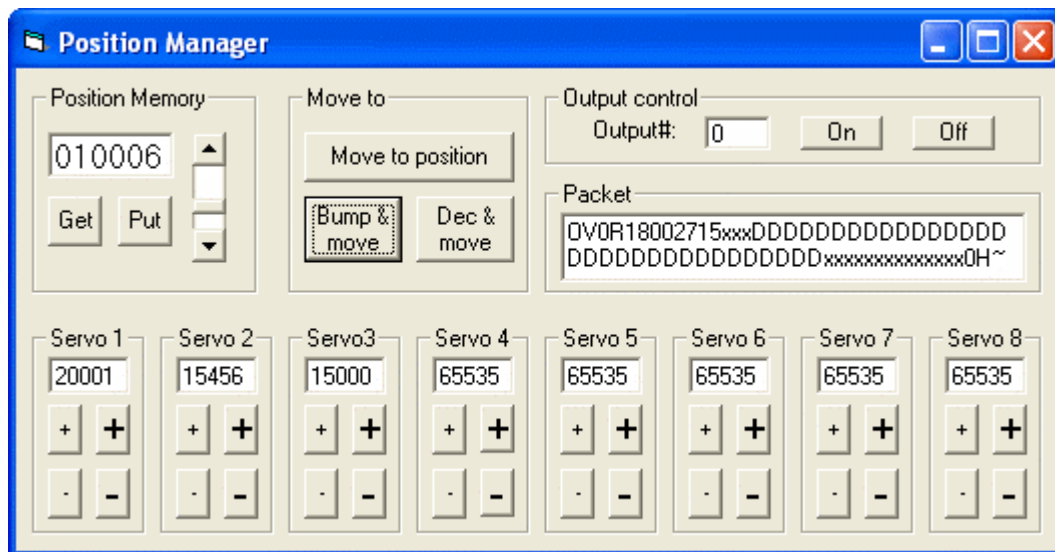


# Scon SM 018 Description / Operation

Scon SM products are small microcontroller based PC boards specifically designed for RC type servos in robotic and testing applications. SM's function primarily as servo pulse generators and do not contain a SconScript interpreter.

Scon SM is easy to use. Just connect your batteries or power source, connect a Scon 232 level translator and a PC then run PScon. You then be able to drive 8 servos with ease.

Scon SM products also use PScon's (PC based software provided with SM products) standard Position manager control to set servo pulses and board parameters. The control is shown below:



With Scon SB's, only the lower 8 Servo boxes are used. The position memory functions are not used. To use the control, simply click the + or – buttons, the small labeled buttons will make a small move and the large labeled buttons will make a large move. The values are in 10X microseconds. For example 10,005 is 1,000.5 microseconds or 1.0005 milliseconds. Scon pulse generators will vary less than .5 microseconds from this pulse width.

The Position manager is located in the “Move and Position control” tab in PScon.

Scon SM's generate very accurate industry-standard positive going servo pulses and are ideal for servo testing. With accuracy of better than .5 microseconds, SM's can be used for determining dead-band, rotation rate, torque as well as other requirements.

Interface is logic level serial and the board requires Scon232 level translator to interface to RS-232 serial ports. In addition to the easy-to-use mouse button driven position manager in PScon, SM's respond to Scon's short 9-byte command set as well as its 64-byte long commands. This provides plenty of flexibility for using SM's as slave servo drivers in Robotic and other applications. Short commands may operate on a single servo, while it is possible to move all 8 servos with a single 64 byte command.

The power circuit in SM's is similar to Scon SB products and utilizes a very low drop-out regulator so that the board can be powered with as little as 5.5 volts. SM firmware supports certain input and output functions that may be added to board hardware.

High servo load conditions may require a separate servo power source. Connect this power source to the orange lead with the negative on the black lead. Connect the logic supply to the red lead and the black lead for return, a 9V battery may be used if the servo power is separate. For most applications, a single 6 Volt battery or 4 AA batteries are used and the orange servo power lead and red logic lead can be tied together and run with a strong single battery.

The Scon SB digital input and output routines are included in SM firmware, however hardware drivers and input buffers are not present on the boards. These through-hole components may be populated from the SB schematic available online if desired.

For Further information please read the documentation provided on the install CD, or go on line at [www.sconcon.com](http://www.sconcon.com)

#### Specifications:

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
Accuracy	Better than ½ microsecond
Interface	Logic level serial
Connectors	.1" spacing 3-square pin standard RC servo format
Baud rate	57,600 BPS

# Scon SM 018 Communication Data

SB's use Standard RS-232 protocols, the boards themselves are logic level and a level translator is required. When used as slaves for other controllers, direct connection may be appropriate. Connection to a standard RS-232 port will damage the board if a level translator such as a Scon 232 is not used. All data is sent and received using ascii characters. Ascii hex is used commonly for byte and double byte length data.

## Short Commands ascii data:

Sequence:

1. Send the Scon board an ascii & attention character.
2. Wait for Scon to answer back with the ascii : character. This will take less than 1 millisecond normally.
3. Send the ascii - (minus sign) to signify a short command with the 9 byte command as -OXDDDDDDH (D is data X is the command) O and H are required. A single string is expected.
4. Wait for a response if needed/expected.

Commands:

Ascii Character	Command
U	Up - Increases the servo value by the data number Data = VVVVSS Note: Data and servo numbers are in hex. V=Value S=Servo number. Example U001007 is increase servo 7's pulse by 16 ( 1.6 microseconds ). Scon returns the servo's new current pulse value in the same format.
D	Down - Decreases the servo value by the data number Data = VVVVSS Note: Data and servo numbers are in hex. V=Value S=Servo number. Example D001007 is decrease servo 7's pulse by 16 ( 1.6 microseconds ). Scon returns the servo's new current pulse value in the same format.
V	Value- Set servo to a specific value. Data = VVVVSS Note: Data and servo numbers are in hex. V=Value S=Servo number. Example V3A9807 is set servo 7's pulse to 1,500.0 microseconds ( 1.5 milliseconds ). Scon returns the servo's new current pulse value in the same format to confirm.
E, R, F, S	Memory editor command sub-set
G, C	Goto and Gosub Commands related to Scon SB products
O	Output control Data = NNS000 NN = Output number in hex (0-255) S =State(0=Off 1=On)

## Long Commands ascii data:

Sequence:

1. Send the Scon board an ascii & attention character.
2. Wait for Scon to answer back with an ascii : character. This will take less than 1 millisecond normally.
3. Send ascii \$ (dollar sign) to signify long command leading the 64 byte command as \$OVXiii\*\*\*\*\*OV~ Total length is exactly 64 bytes including everything between the first O and the last V. The ~ is character 65. A single string is expected.
4. Wait for a response if needed/expected.

Breakdown:

X=Various generally 0

iii=Instruction - Byte string Location = 4,5,6

Commands:

Ascii Instruction	Command
R01	Echo back all servo pulse values. Byte string location starts at 7; Servo 1 value returns at 7,8,9,10; followed by servo 2's values. Values are in hex 0-65,535. First data is MSB.
D0L	Return with value from inputs. Single byte data is in string location 13. Ascii 0 = all inputs are 0. Input 1 adds 1 if on; Input 2 adds 2 if on; Input 3 adds 4 if on.
R0D	Set all servos to the hex values. String positions same as R01

Additional commands that are not used on SM or are controls used by PScon are not listed.

# Using PScon

PScon is a Windows XP compatible program that controls and downloads programs into a Scon SB product.

## Setup of PScon:

PScon is the PC compatible program that controls Scon products. PScon runs under Windows XP and requires one serial port. Quality USB to serial converters may be used.

To setup PScon, run the install.exe file provided on the install disc, USB stick, or download. Refer to “Install Issues” at the end of this manual for Trouble Shooting.

If a Com port error occurs when PScon runs, refer to “Com Port Issues” in the “Trouble Shooting” section.

Once the serial port is functioning, verify that the Scon product is properly working by Selecting “Send Command” from the Setup and Tools drop down menu. Click the Request Version button and Scon will report back the version number. This verifies proper communication.

The default file locations are set in the System Setup screen from the Setup and Tools dropdown. Default locations are all set to C:\runner a required directory that contains the parameters. The default Scon and temporary file locations can be changed if desired.

## Board Setup:

Select “Board Setup” from the Setup and Tools dropdown. The parameters are read when the display loads; clicking “Get Parameters” will re-load the parameters.

First, check the box for each servo that is to be used. All servos will receive a pulse and may be directly controlled; however, the Scon engines will only update and move the servos that are checked as “Active Servos”. If a servo is selected and not present, movement information will be generated for that servo. If a value is read for a servo that is not present it may appear that the board is not working when it is actually generating data for the servo that is not there. This could take over a minute to complete. This is why it is best to un-check the non-present servos in the “Active Servos” box.

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. Power cycling the board or clicking the “Reload from EEPROM” button will reset the board and load the new values.

# Trouble Shooting PSCON

## Install Issues:

PScon.exe is a complete program that will run on most PC's without full installation. However it does require mscomm32.ocx (the serial port driver) to be installed in the windows system path. This will be done automatically by the install utility if used.

If a problem occurs during installation, copy mscomm32.ocx into the computers Windows system directory, then click on PScon to run it without a full install.

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

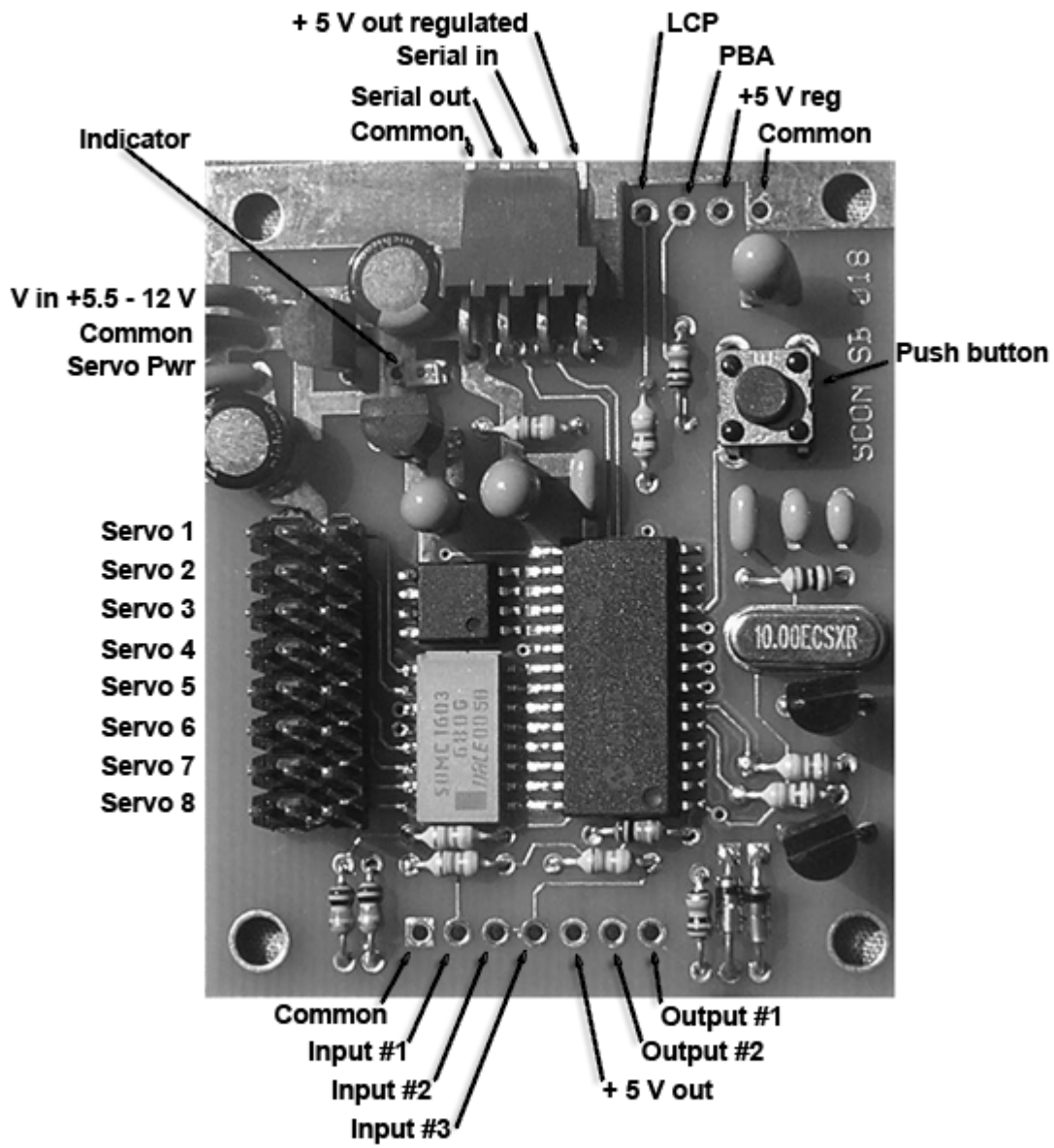
## Com Port Issues:

If a serial port error occurs the first time the program runs; the pre-set default serial port may not be present on the computer. To set or change the serial port from the main screen "Main Control", select the "Setup and Tools" dropdown menu. Set the port to the desired port number, the baud rate should be 057600, parity n, length 8, and stop bits 1. The parameters MUST be saved BEFORE selecting "Re-Connect Com port". If the error occurs again, try selecting port numbers until the correct port is located. The comport number can be located using Windows Desktop or Start tab by right clicking "My Computer", selecting "Properties", and then "Hardware", and then "Device Manager", and then "ports (COM & LPT)". This will list all of the ports present on the computer. Once a valid port is selected, PScon will run without error even if the Scon board is not present. However; the Scon board must be plugged into the selected port to operate properly.

## Program Run Errors / Issues:

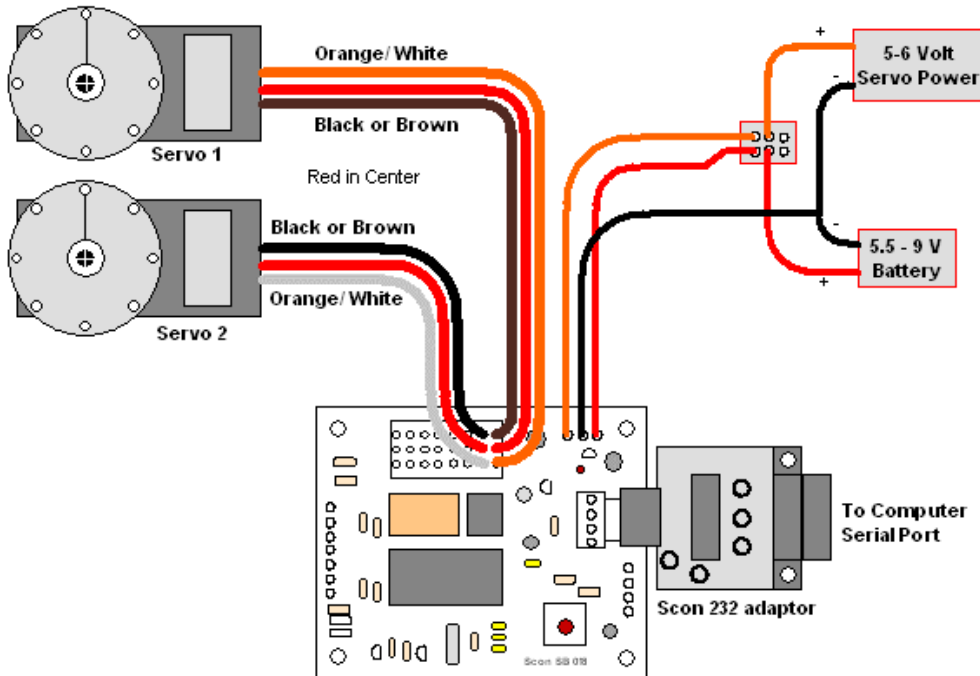
PScon does not list many errors. If the program does not work as expected check the Scon program carefully. Misspelled keywords may be ignored.

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



# Connection Diagrams for Scon SB 018 All versions

## Connections - Separate Servo and Controller Power Source



## Connections - Same Power Source Servos and Controller

