What are NXTServo Macros?

NXTServo can store servo positioning commands and related logical constructs in it's permanent memory. The macro space on NXTServo is 256 bytes. Each macro could be of any length, and you can store several macros on NXTServo. The macros are stored in ROM memory, i.e. they are retained even after power is removed.

For example, if you are making a hexapod, where the 6 servos are moving in unison with each other, the movements of these servos can be coded in a macro and executed on NXTServo. Thus keeping your NXT free to do other tasks.

Macro Parameter representations

Parameter type	Length	Examples
mTime	4 bytes in visual hexadecimal	0550 (1360 micro-seconds)
Time	4 bytes in visual hexadecimal	0800 (2048 milli-seconds)
Address Location	2 byte (visual hexadecimal – uppercase)	42 (location 0x42)
Voltage	2 bytes in visual Hexadecimal – uppercase	CB (voltage value 0xCB)
Counter	2 byte in visual hexadecimal (max FF)	45 (counter value 69)
Servo Number	1 visual byte	1 (first servo motor)

Macro op-codes and their byte-codes

Table below lists the op-codes and their respective byte codes:

Op-code	Command	Parameter	Example
Jxx	Jump to specified location	Address Location	J41 (jump to location 0x41)
T	Return to calling function	-	T

Lxx	Call a function at given location	Address Location	C42 (call function at 0x42) (call stack is 16)
Z	Zero the time	-	
Snxxxx	Set Servo position to given value	Servo number, mTime	S10800
Pnxx	Set servo speed to given value	Servo number, Counter	P199
Wxxxx	Wait for given time	Time	W0100
Rnn{…}	Repeat following block n times (block within {})	Counter, {block}	R10{S10500S11500} (repeat stack is 16)
?V=xx	If voltage is not equal to xx, skip next three bytes of macro	Voltage	?V=08J55S10500S11500
?V<xx	If voltage is greater than xx, skip next three bytes of macro	Voltage	
?V>xx	If voltage is less than xx, skip next three bytes of macro	Voltage	
?T=xxxx	If time is not equal to xxxx, skip next 3 bytes	Time	
?T<xxxx	If time is less than xxxx, skip next 3 bytes	Time	
?T>xxxx	If time is less than xxxx, skip next 3 bytes	Time	

How does a macro look like?

Macros are stored in ROM memory from address location 0x21 upto address location 0xFF.
Example of macros below:

Address Loc	Macro code	Explanation
0x21	J 3 0	Jump to address 0x30
0x30	S 1 0 5 5 0	Set Servo 1 to position 0x0550 (1360)
0x36	W 0 1 E 8	Wait for 0x01e8 (488) milliseconds
0x3B	S 1 0 6 4 0	Set servo 1 to position 0x0640 (1600)
0x41	W 0 1 E 8	Wait for 0x01e8 (488) milliseconds
0x46	J 3 0	Jump to address 0x30
0x50	S 8 0 8 F F	Set servo 8 to position 0x08ff (2303)
0x56	W 0 3 E 8	Wait for 0x03e8 (1000) milliseconds
0x5B	S 8 0 4 F F	Set servo 8 position to 0x04ff (1279)
0x61	W 0 3 E 8	Wait for 0x03e8 (1000) milliseconds
0x66	? V > 8 0 j 5 0 j 6 6	If voltage is greater than 0x80, go to location 50 or go to location 0x66 (keep checking for voltage condition).

How do I create a Macro?

Currently editing of macro is manually done by byte-by-byte construction.

How to download macro to NXTServo ROM?

To enter macro edit mode, Issue 'EM' command to NXTServo. Upon which, the NXTServo enters into edit mode, with a different I2C address. The new address is 0x40. This address stays in effect until command 'Q' is issued or next power cycle. While in this mode, you can read/write to the macro address space.
Following I2C commands, except 'Q' can be issued to primary NXTServo I2C address to access or edit macros.

H	Halt Macro (This command re-initializes the macro environment)
R	Resume macro Execution ((This command resumes macro where it was paused last, using the same environment)
Gx	Go to EEPROM position x (This command re-initializes the macro environment)
P	Pause Macro (This command will pause the macro, and save the environment for subsequent resumption)
EM	Edit Macro (Enter into macro edit mode, where the macro memory space can be read or written)
Q	Terminate Edit mode – Note, issue this command to register 0x00 while in edit mode (I2C address 0x40)

Currently support exists in NXC to write macros to your NXTServo. Please refer to website download section for sample programs.