# NMA1 - NanoMuscle™ Adapter Board
1-pack #4-021 or 5-pack #3-944

Section 1 - Introduction

This tiny circuit board permits the easy connection from the NanoMuscle ribbon connector (that has five 1 mm spaced contacts), to a standard 0.100" spaced connector. Especially helpful for hobbyists, experimenters and prototype builders.

The board has twin mounting holes for 3 mm or #4 screws, and it has surface mount pads for adding a power indicating LED and two 10KΩ pull down resistors for the two NanoMuscle signal lines (surface mount components not included).
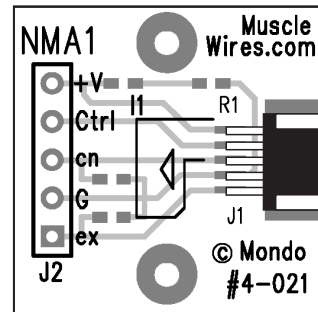


Component side of the circuit board.

Section 2 - Basic Setup

Location J2 can receive individual wires, or a 5-pin header, either straight or angled, or a 5 conductor ribbon cable with a 5-pin connector at its end. Using a ribbon cable permits the NMA1 to be mounted near the location for your NanoMuscle and to have the controller further away. Be sure to solder all components cleanly and securely for best performance.

This example shows a NanoMuscle lifting a mass when activated by a push button switch.

1)	1	NanoMuscle, NM70
2)	1	NMA1 Adapter Board
3)	1	Switch, pushbutton, momentary
4)	1	Battery holder, 2 AA cells
5)	2	Battery, AA (alkaline, NiCd, etc.)
6)	1	Weight, 70 gram (28 U.S. 1 cent coins)
7)	1	Paper clip
8)	1	Wood block (or popsicle sticks, plastic sheet, sturdy cardboard, etc.)

Plus screws, hook-up wire, solder, etc.
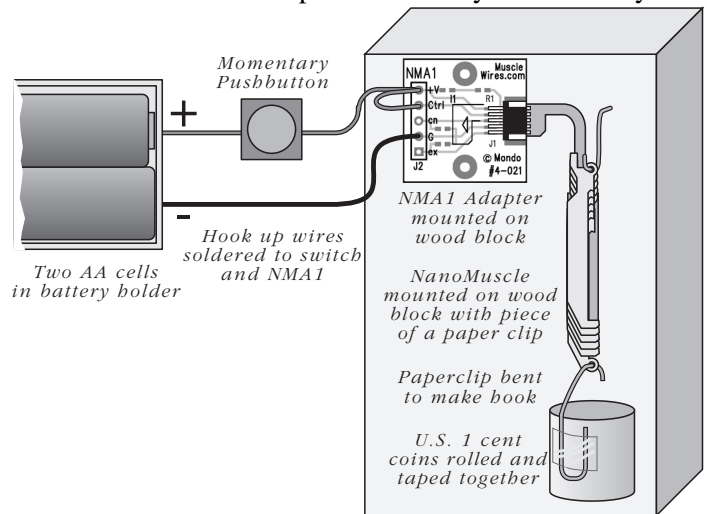
Section 3 - Advanced Setup

This more advanced example uses a Stamp 2 microcontroller and a Stamp Board of Education (BoE) printed circuit board assembly to permit computer controlled operation of the NanoMuscle. This setup requires a PC to be connected to the Stamp BoE controlled for programming, and the Stamp senses the "ex" and "cn" signals from the NanoMuscle to cycle it on and off at its maximum natural rate.

1)	1	NanoMuscle, NM70
2)	1	NMA1 Adapter Board
3)	1	Cable, ribbon, 5 conductor, 25 cm (10 inch)
4)	1	Header, 5 x 0.100"
5)	2	Resistor, 10KΩ 1/4 W
6)	1	Weight, 70 gram (28 US one cent coins or other mass)
7)	1	Paper clip
8)	1	Wood block (or wood sticks, plastic sheet, heavy cardboard, etc.)

Plus hook up wire, Stamp 2, Board of Education, AC adapter, programming cable, PC with serial port, etc.
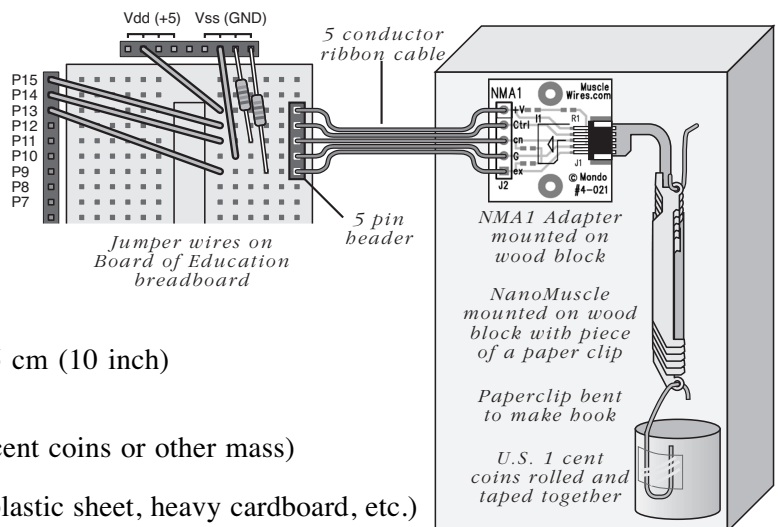
Assemble the parts as shown, inserting the hook-up wires into the bread board to create the connections. Then enter the following program into the Stamp 2 editor and download it into the Stamp. (See the Stamp manual for complete instructions on programming and using the Stamp.)

```
'NMA104.bs2 - NMA1 NanoMuscle Adapter Board Stamp 2 demo
'Cycle NanoMuscle at maximum rate - RG 0210.31

output 15    'Connect to NMA1 Control line "Ctrl", make = 1 to contract
input 14     'Connect to NMA1 Contracted signal "cn", 1 = contracted
input 13     'Connect to NMA1  Extended signal "ex", 1 = extended

Loop:              'Begin
     high 15             'Turn NM on
     Contr:              'Loop until contracted
          if in14 = 0 then Contr
     low 15              'turn NM off
     Relax:              'Loop until relaxed
          if in13 = 0 then Relax
goto Loop
```

This program first activates the NanoMuscle by turning P15 high, then it waits for P14, the "cn" (contracted) line, to go high, indicating that the NanoMuscle has fully contracted. The program then turns the NanoMuscle off via the "low 15" command and waits for the "ex" (extended) line (P13) to go high, indicating that the unit has fully relaxed. Then it repeats. Use this program as a starting point to program and operate your own NanoMuscle devices.

Section 4 - Surface Mount Options

Look carefully and you'll note that the NMA1 has pads for four surface mount (SMT) components. You may carefully solder your own SMT parts in place to use these features. Placing a LED at position *I1* and a resistor at *R1* permits the LED to light when power is present on the NMA1 board. (Position LED with bar end towards R1). Locations *Rex* and *Rcn* accept 10K pull down resistors. You can get the optional components from DigiKey.com and others:
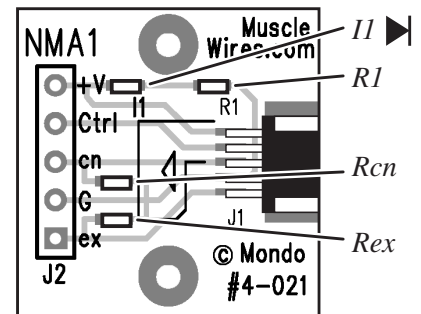
Location	Description	Vendor #
I1	LED 635nm Red Diff. 0603 SMD	DigiKey #67-1548-1-ND
R1	Res 680Ω 1/16W 5% 0603 SMD	DigiKey #311-680GCT-ND
Rex & Rcn	Res 10KΩ 1/16W 5% 0603 SMD	DigiKey #311-10KGCT-ND

If you have not soldered or assembled electronics before, please see our PDF "How To Solder" on our web site at <http://www.RobotStore.com/support.asp>, or get the assistance of an experienced board assembler.

Section 5 - References & Contacts

For more tons more information about shape memory alloys, NanoMuscle actuators, Muscle Wires, Electric Pistons and more, please visit our web site at <http://www.MuscleWires.com>

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Email us at: support@MuscleWires.com

Thanks!

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