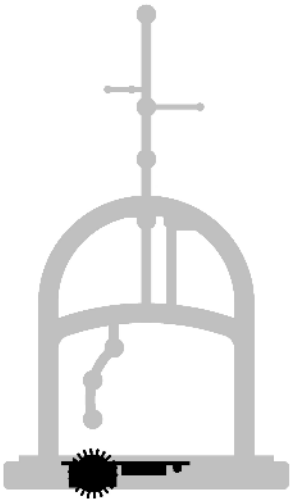
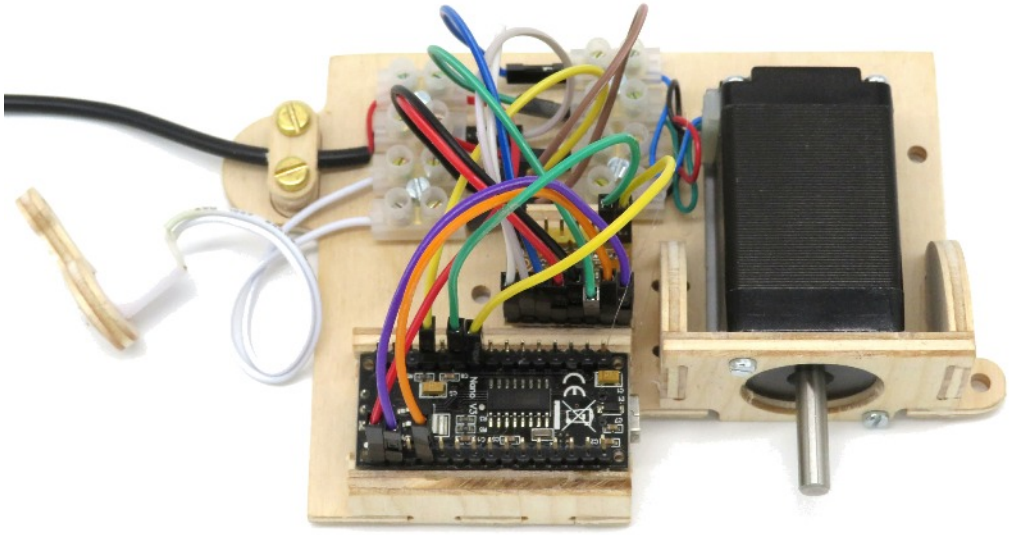
22 MOTOR





The first question to be answered is why so complicated, the answer is simple, silence.

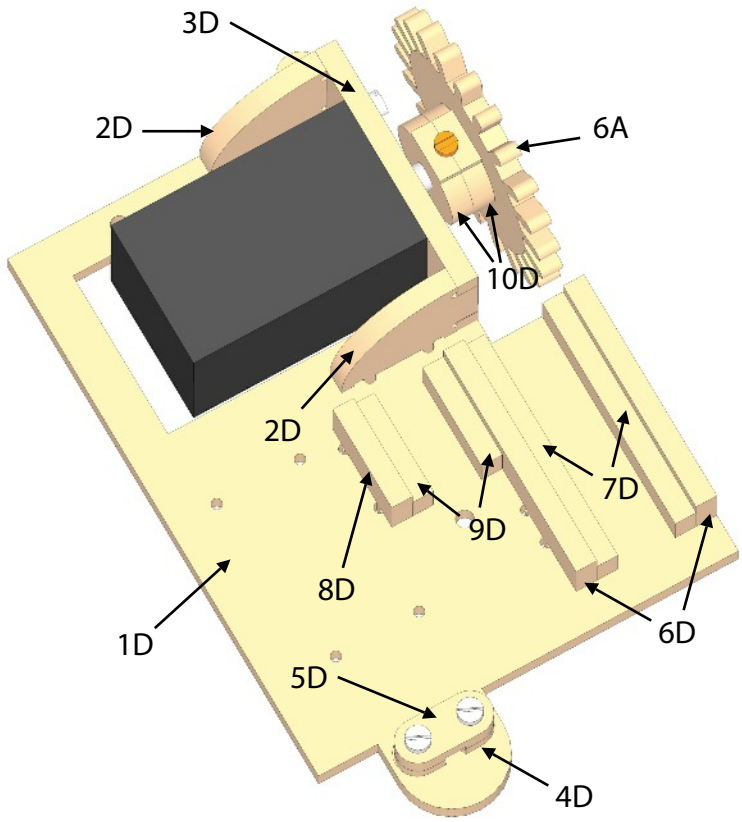
I went through a large number of geared DC motors of increasing price and although they only require a DC supply they were all way too loud, whenever the motor kicked in it was almost like a vacuum cleaner starting. I tried insulating against structure as well as airborne sound but to no avail and totally unacceptable.

The option I went for is a stepper motor controlled by an Arduino Nano and driven by a SilentStick Driver.

So basically the Arduino Nano has a small software program running in a loop, which I have already pre-installed, it instructs the SilentStick Driver to turn the stepper motor in a certain direction and at a specific speed. A magnetic reed switch switches the SilentStick Driver on or off and ultimately stopping or starting the stepper motor.

On the Tredecimus special site you can find a more in depth description as well as the software used.

23 MOTOR



The motor and controllers are assembled on a separate board which when finished is simply screwed into the bottom of the clock base.

It may seem slightly daunting to start with but if you follow each step carefully you should have no problems at all.

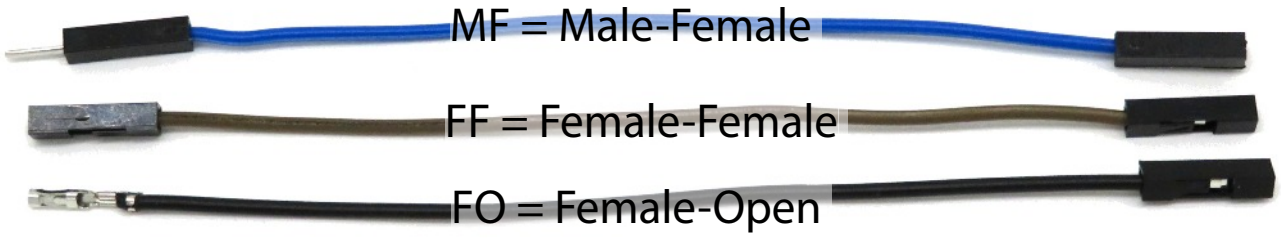
I have split the wiring into 3 parts for clarity.

The first part shows all the power connections.

The second is the connection of the motor to the SilentStick Driver.

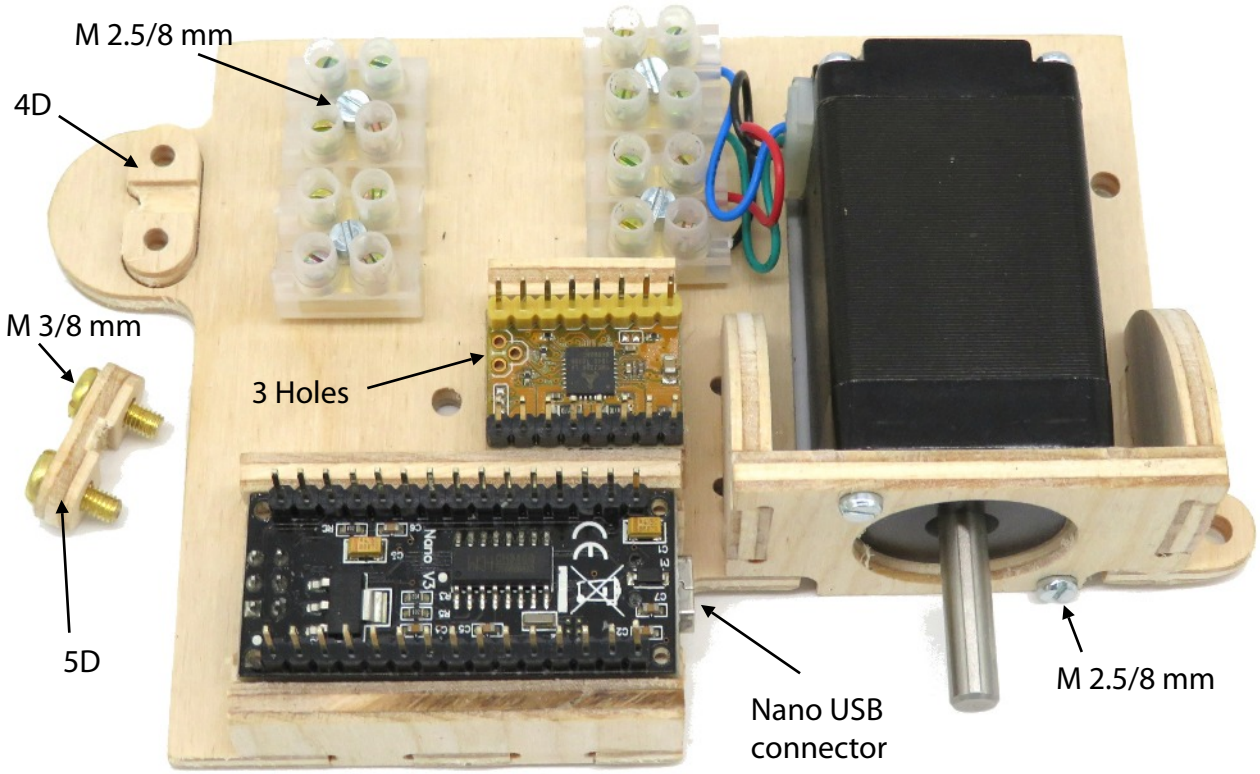
The third part shows how the switch and the Arduino/Driver are connected.

As the plans are printed in grey scale I have written the colour on each cable as well as the cable type as follows.



FO is only used twice for the Plus power and is simply a FF cable with one of the plastic sleeves pulled off .

24 MOTOR



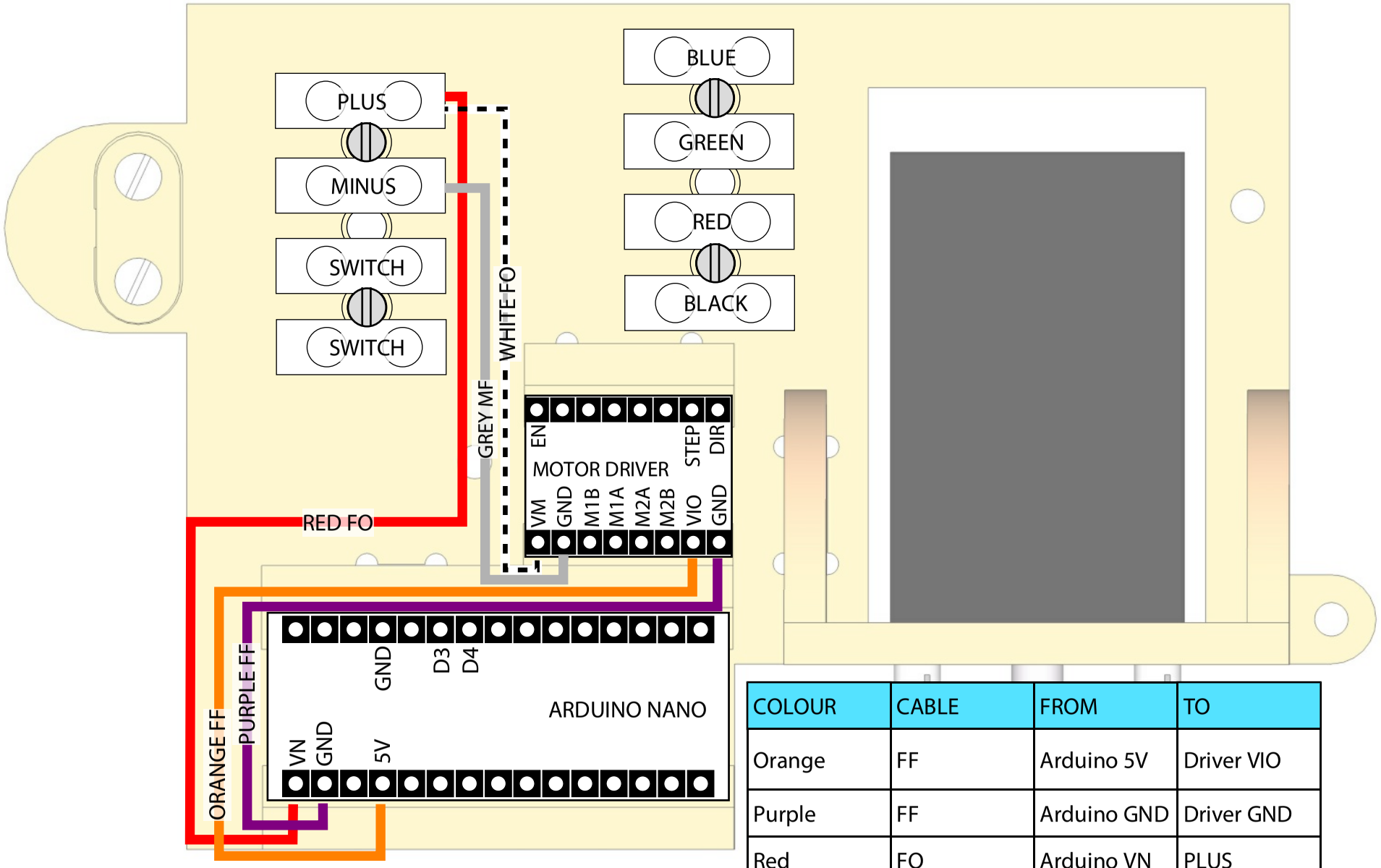
Glue 4D into the recess on the base 1D, when you have wired up the cable to the USB charger screw on 5D to clamp it.

As the space is limited you will find it easier to wire up the motor in the screw terminal before you screw it on to the bracket. To reduce the amount of cable on the board you can trim the stepper motor wires to a length of 45 mm.

Although today's electronics are not quite as sensitive as they used to be I would still recommend using the precautions as for all electrostatic sensitive devices.

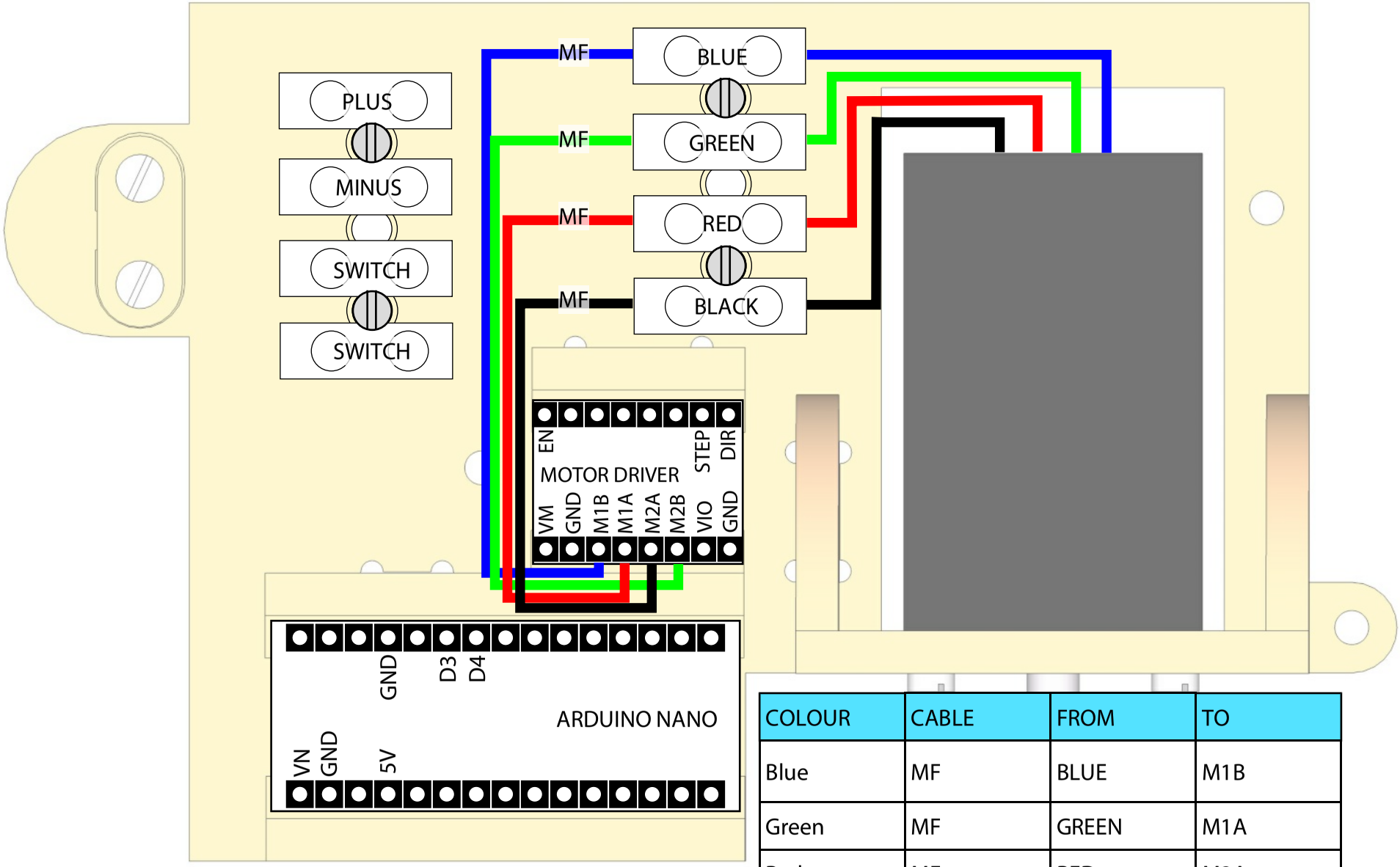
The Nano and driver boards are sitting loose with their pins pointing upwards with the pin names on the bottom, once everything is up and running you can glue them in place.

The cables come in bunches of 10 however not all will be used.



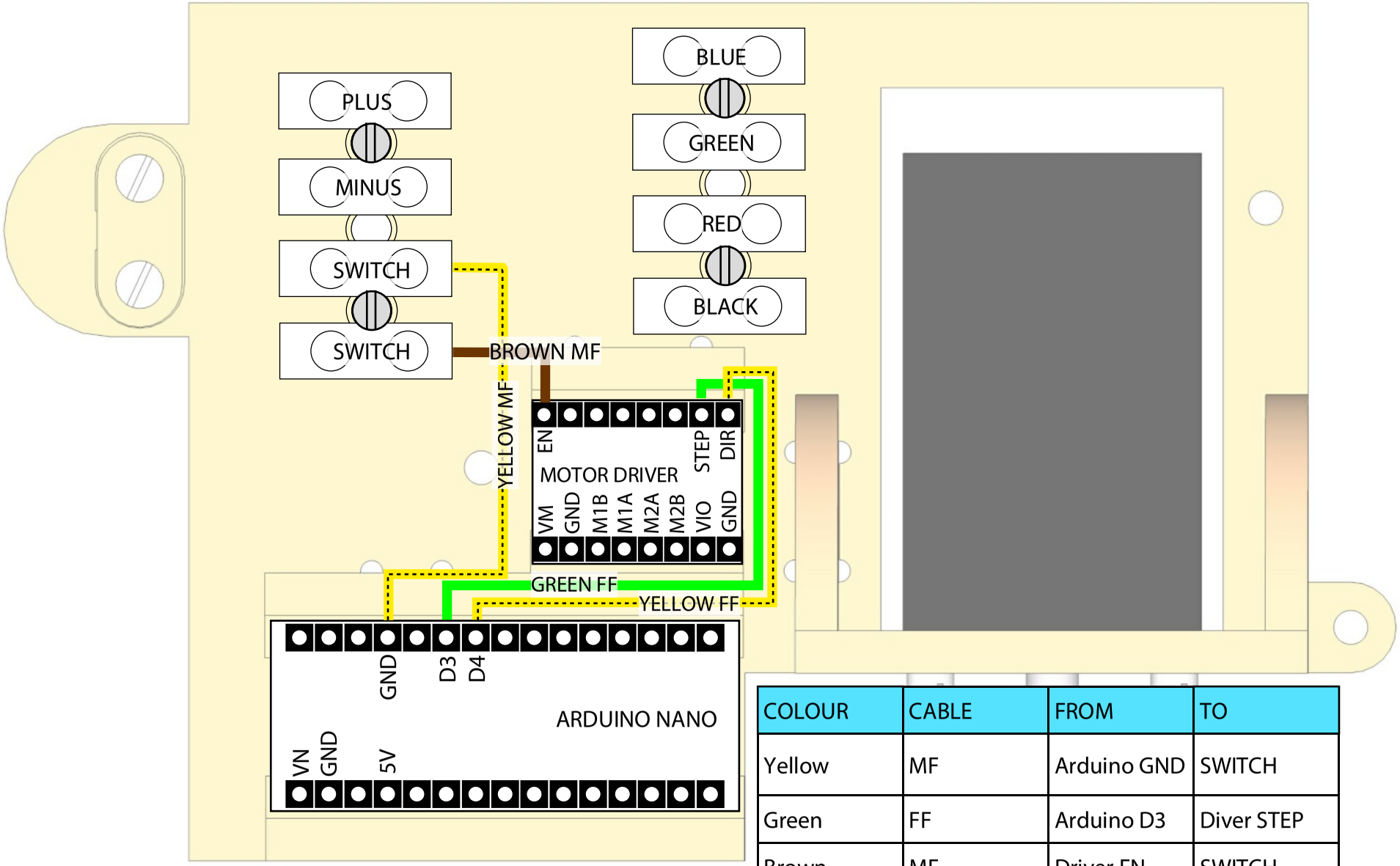
COLOUR	CABLE	FROM	TO
Orange	FF	Arduino 5V	Driver VIO
Purple	FF	Arduino GND	Driver GND
Red	FO	Arduino VN	PLUS
Grey	MF	Driver GND	MINUS
White	FO	Driver VM	PLUS

POWER CONNECTIONS



COLOUR	CABLE	FROM	TO
Blue	MF	BLUE	M1B
Green	MF	GREEN	M1A
Red	MF	RED	M2A
Black	MF	BLACK	M2B

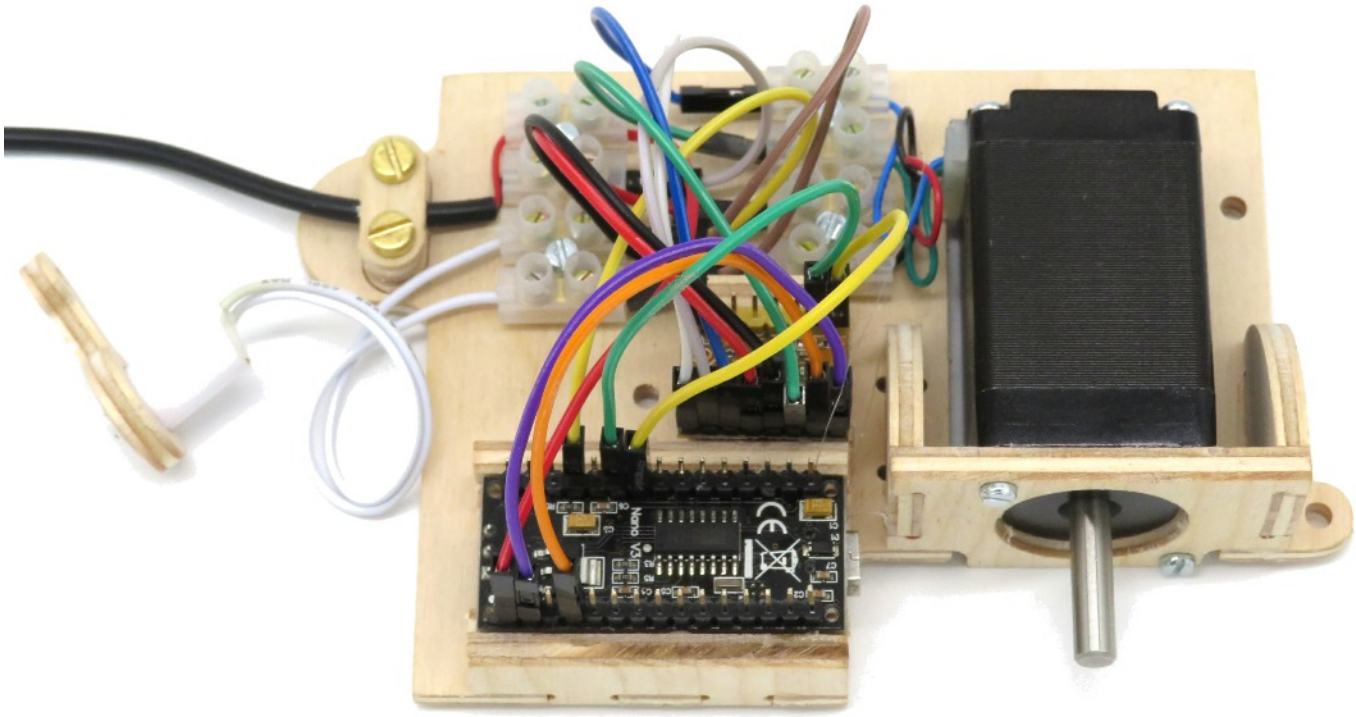
MOTOR TO SILENTSTICK



SWITCH AND ARDUINI/DRIVER

COLOUR	CABLE	FROM	TO
Yellow	MF	Arduino GND	SWITCH
Green	FF	Arduino D3	Diver STEP
Brown	MF	Driver EN	SWITCH
Yellow	FF	Arduino D4	Drvier DIR

28 MOTOR



The motor is powered by a standard USB phone charger, this is not included because of differing plug standards. Cut off the plug at cable end and strip back to the red (plus) and black (minus) wires and screw into the screw terminal.

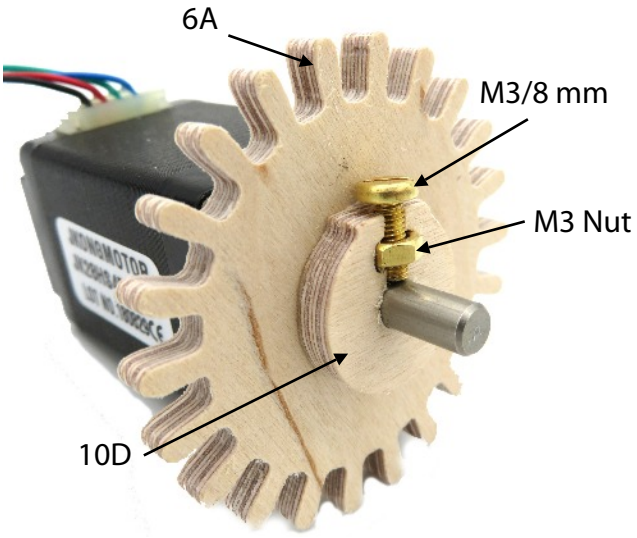
The reed switch has no polarity so it does not matter which wire you connect to which SWITCH terminal, slip over switch holder 11D before you screw the wires, you can also shorten the wire length to 12cm.

When you add power the green LED underneath the Nano will light up, now test by moving the magnet towards the reed switch.

The motor should switch on and off depending upon magnet distance.

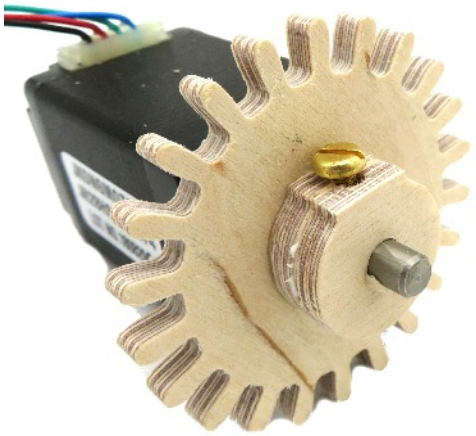
If this is not the case then check every connection also check that the wires in the screw terminals are not loose.

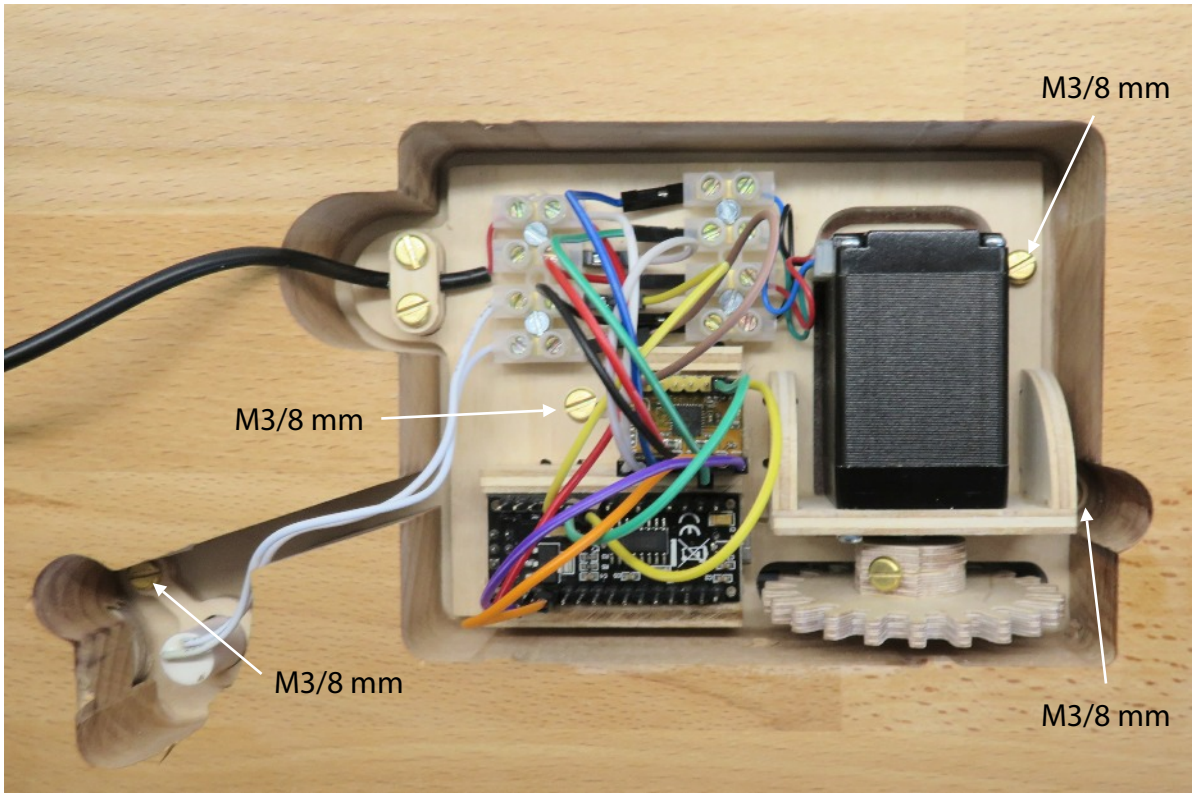
29 MOTOR



The cog 6A needs to be securely joined to the shaft of the stepper motor. Glue 10D to the cog and insert the M3 screw and nut as shown.

Then glue on the second 10D. The whole assembly should be removed and reversed so the cog is at front, as you can see below.





30 MOTOR

The board is held in place by 3 x M3/8 mm screws screwed into the holes in the base cover, the magnetic reed switch holders is also held by a M3/8 mm screw.

The next chapter deals with the magnetic trigger but as it also belongs to the motor we will go through how to adjust the reed switch so it functions correctly.

When the trigger has been released and the magnet is at its lowest position it will cause the reed switch to close and the motor starts, but when the lift arm pushes down on the trigger it lifts the magnet, the reed switch opens and the motor stops.

The reed switch should open when the trigger/magnet has only been lifted approx. 5 mm. If the motor does not stop then the switch needs to be moved away from the magnet, just loosen the bracket screw and turn the switch away from the magnet position.

If the motor does not start even when the magnet is at bottom then move the switch towards the magnet.

Once everything is working as it should you can screw on the cover (page 17) using 4 x M3/20 mm screws