Polargraph #1: Intro.

Thanks very much for getting a polargraph kit! Have a root around in the box and make sure I packed all your parts properly.

Seeeduino: This is the brains. It's a slightly more businesslike alternative to a brand name Arduino, and it's this bonny colour too.
It does the business. There's a USB cable for it, and a power supply pigtail.

Motorshield: Designed by Adafruit, a modern classic. With polarised, latching connectors for the motor cables.

Gondola: It dangles, hence the name. This is the pen holder. This is push-fitted together. If it gets a knock and comes to pieces, it'll push fit back. If it gets too loose, a dab of glue will fix either end in place, but until then, it's modularity is a strength. And
2x 2 metre lengths of beaded cord.

Motors: Pretty generic, but work with lowish voltages, and don't draw more than 600mA each. That's the limitation of the motorshield. 400 steps per revolution. The sprockets are Polargraph originals, 3D printed with lasers, made to fit the beaded cord. The motors are mounted to some bits of lasercut plywood, more Polargraph originals.

Motor cables: There's a short one and a long one, both the same except for their length. Each has a 4-way plug to go into the motorshield, and a pair of 2-way plugs to go into the motors.

Motor bracket parts: There's a back plate, that you will stick onto your drawing surface, and two little cactuses that the motor mounts will hook onto. Lasercut plywood again. It smells great.

Power Supply: Gives 1 amp (1000 mA). Variable voltage lets you increase the voltage if you decide you want to live on the edge. For camping, near the edge, set it to 6v.

Pen lift servo: This can be stuck to the gondola and used to raise the pen off the surface at the end of a drawing. Includes 2m extension lead.

Software:

The controller application runs in Processing. You will need to download the Processing environment from **www.processing.org**.

To update the firmware on the arduino, you will need the Arduino environment. You can download that from **www.arduino.cc**.

You should then visit **code.polargraph.co.uk** and download the application code itself and read the wiki.

And of course, read what's going on at **www.polargraph.co.uk**!

Polargraph #2: Setup.

Centre yourself and find a place to install your Polargraph machine. It should be a flat surface, ideally tilting backward slightly. A large board is good, leant against the wall, around 800mm wide by 1000mm tall, but a big IKEA Ribba picture frame is also a good choice for A2 drawings.

Fixing: Use whatever adhesive or tape or screws or nails you like to fasten the motor bracket back plate onto your surface. I've used some temporary ("no more nails") double-sided tape.

Markings: You need to draw out some markings on your surface. Be accurate - it will not be possible to calibrate your machine later if your motors are not level, your lines aren't parallel, or your centreline is not dead centre. Mark at least the dashed lines in the diagram below.

MACHINE WIDTH

sprocket
outline

machine width / 2

centreline

120mm

top edge
of page

HOME
POINT
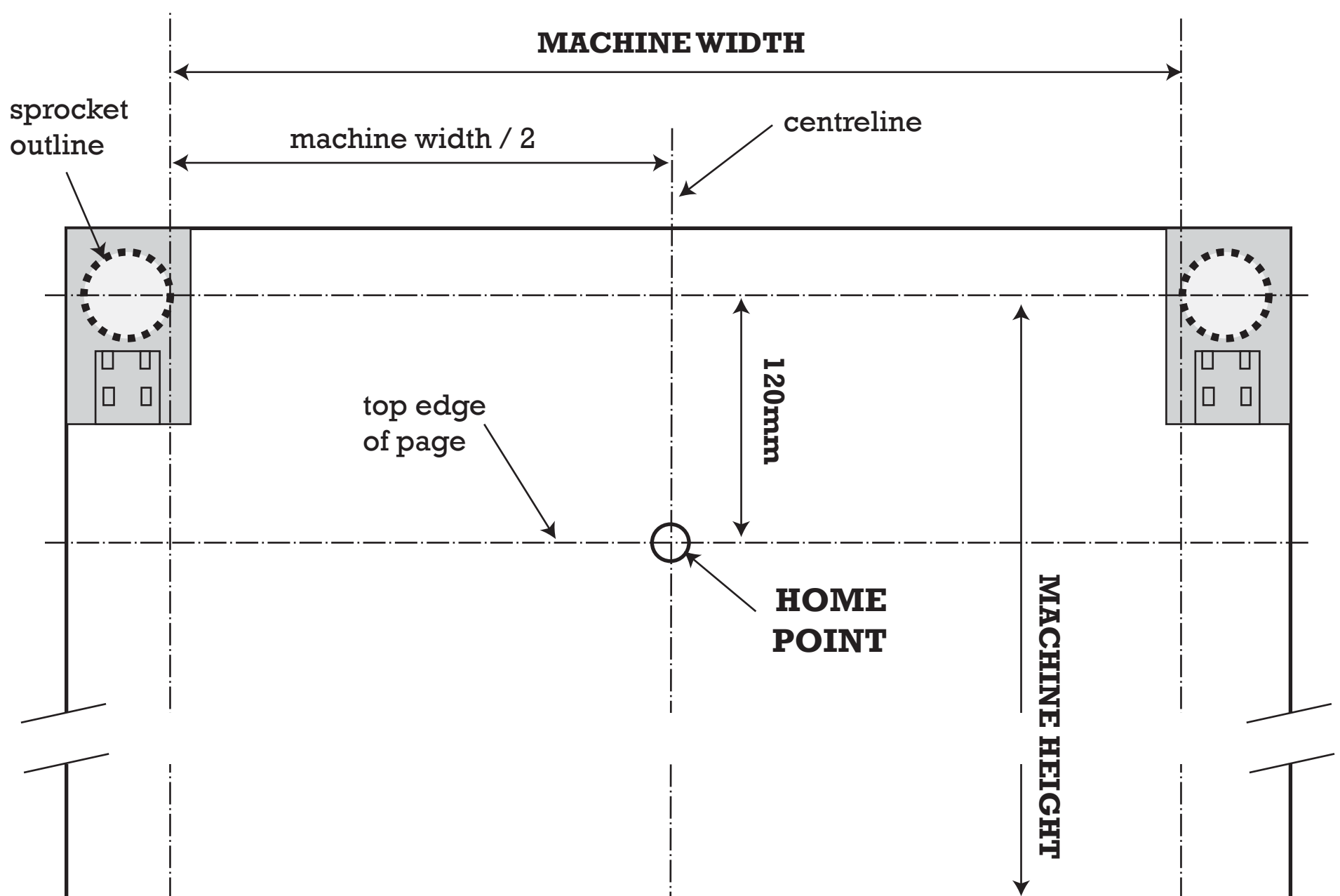
MACHINE HEIGHT

Three important things:

MACHINE WIDTH: This is the distance between the two closest points on the sprockets.

MACHINE HEIGHT: This is the distance from the sprocket axis to the bottom of your drawing area.

HOME POINT: This is a magic point marked on the centreline, exactly 120mm down from the top edge of your machine,

Also remember that your machine size is NOT the same as your surface size. It'll be smaller. Your PAGE size will be smaller again.

Polargraph #3: Wires.

Each motor has a pair of connectors on it. Each motor cable has a pair of connectors on one end, and a single connector on the other. The cables are identical, except that one is short and one is long. Doesn't matter which one you use on which side, but the cables should go together like this:

Plug Motor A's cable into the left hand side of the controller (marked M1 and M2), and MotorB's cable into the right hand side of the controller (marked M3 and M4).
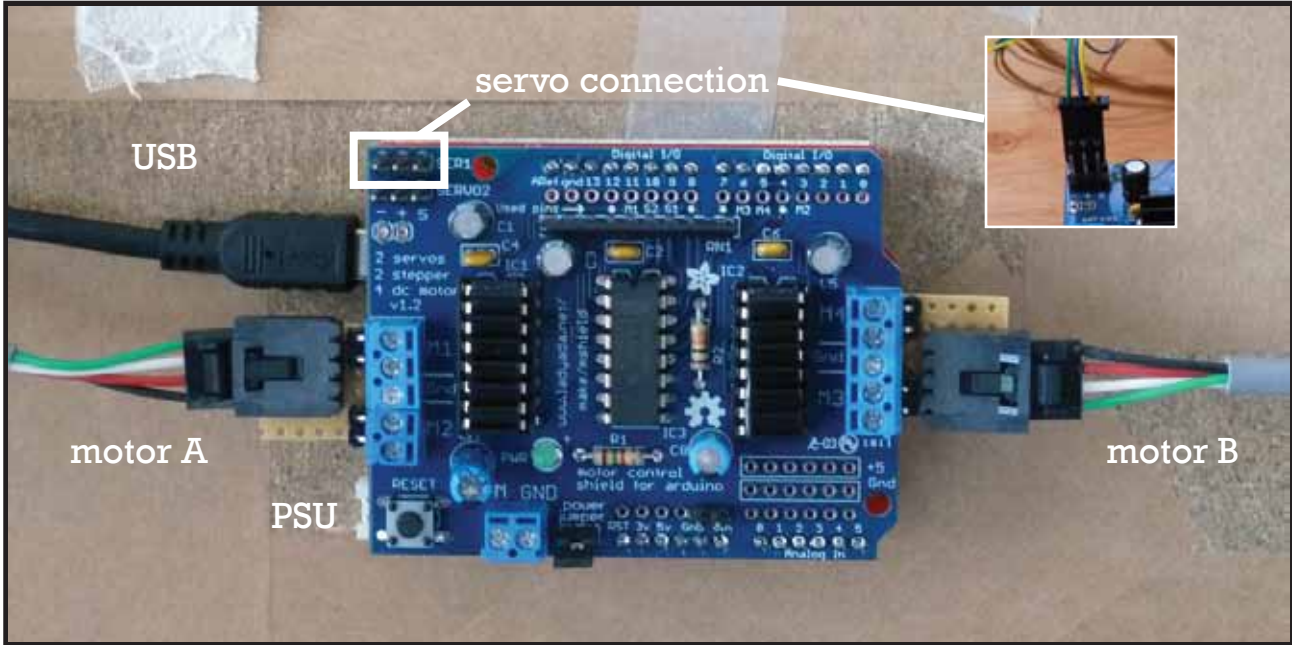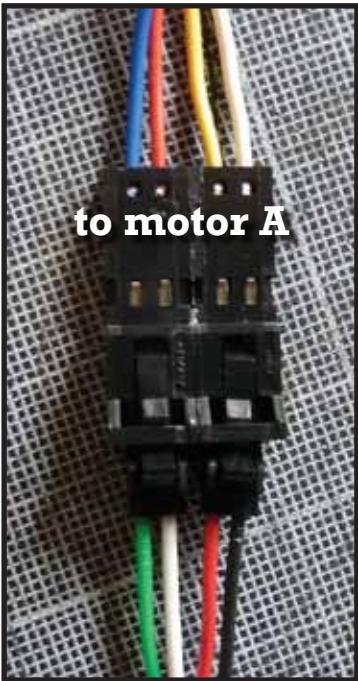

machine.motors.stepsPerRev

PSU

USB

CONTROLLER
(arduino + motorshield)

LEFT HAND MOTOR
(AKA MotorA):
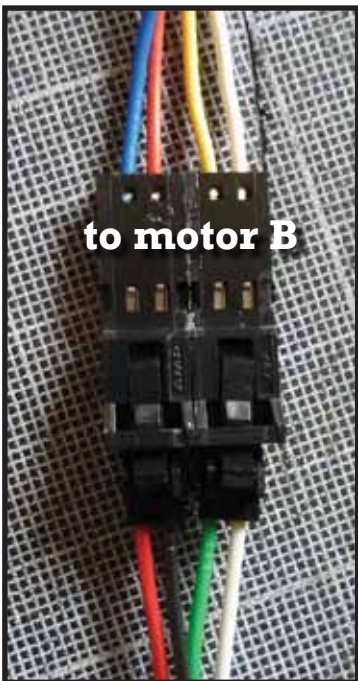Put the connectors in so that the red and the white wires are next to each other, in the centre.

RIGHT HAND MOTOR
(AKA MotorB):
Put the connectors in so that the green and the black wires are next to each other, in the centre.

to motor A

green, white, red, black

to motor B

red, black, green, white

#4: Gondola & GO.

The **gondola** is easy to set up. Pop the end of each of the cords into the hooks on the gondola, and tie some weights to the other end. The exact placement of the weights depends on the size of the machine. The exact weight isn't critical either, but it should be enough so that when the cords are over the sprockets, the gondola hangs naturally somewhere in the middle of your drawing area. Mine are about 150 grams each, made of washers on a bolt.

And finally:

Power:
Find a tip that fits from the PSU kit, and connect it centre positive (see pic). Set the voltage of the PSU to 6v to begin with. Plug it in to the power connector!

USB: Plug it into your computer. It should recognise it, and might install the drivers automatically. If it doesn't, you can find drivers in your Arduino application folder.

Software

There's a decent instructable guide to setting up the software at:

http://www.instructables.com/id/Polargraph-Drawing-Machine/step11/Controller-software-install/

When you come to setting your machine specification in the proeprties file (polargraph.properties.txt), your values are:

machine.motors.mmPerRev=84
machine.motors.stepsPerRev=800.

machine.width and **machine.height** with the measurements you took when you set up your machine surface.