

Zero2 Microrobot

Assembly Instructions

ZERO 2 MICROROBOT KIT
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ASSEMBLY INSTRUCTIONS
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When you open the kit, you should check first that the following are present:

- 1) ZERO 2 Instruction Manual
- 2) A cassette of software for your computer
- 3) An Interface cable (umbilical) with plug attached
- 4) The Robot base and shell containing the pelvis (frame)
- 5) Bag containing metal parts : Qty.
 - a) Pen Slide Z2-4 1
 - b) Axle Clamp Z2-5 1
 - c) Axle Z2-6 1
 - d) Pen Clips Z2-30 2
 - e) Axle Spring Rubbers Z2-28 2
- 6) Bag containing plastic parts:
 - a) Wheels Z2-8 2
 - b) Rubber tyres Z2-9 2
 - c) Slide Pillars Z2-7 2
 - d) Wheel Spacing Washers Z2-27 2
 - e) Orange PCB Pillars Z2-14 2
 - f) Toe Cap assembly parts Z2-11:
short orange spacer, screw fixture, cap
 - g) Pen Lift Cam Z2-13 1
 - Pen Clip Spacers 3
- 7) 3 stepper motors:
 - Short lead - Pen Motor 1
 - Medium lead - L.H. Motor Z2-12 1
 - Long lead - R.H. Motor 1
- 8) Fasteners

Screws: Qty.	Dims ./Type	(All threads are Metric)
Z2-16 3	M3 x 8 mm	(2 + 1 spare for pen clip adjustment)
Z2-15 10	M3 x 5 mm	(General)
Z2-17 12	M3 Hex Nuts	
Z2-19 2	M4 x 16 mm Panhead	(Slide Pillars to Base)
Z2-20 1	M4 x 15 mm Countersink	(Toe Pillar)
Z2-18 2	M4 x 40 mm Phillips Pan	(PCB to Pelvis)
Z2-25 4	Star Nuts	(2 to secure wheel, 2 spare)
Z2-22 4	M3 x 8 mm Nylon Screws	(Shell to Base)
Z2-32 1	M4 Steel washer	(Toe assembly)
	M4 Cage Nut	(Can be fitted in top of pelvis for superstructure/add - ons)
Z2-23 4	M3 Hex nuts nylon	
- 9) Z2-26 1 Cable Support (Halo)

Having checked the Parts List, you can now start to assemble the robot. Some parts are pre-assembled, so a small screwdriver is the only tool you will need:

The loudspeaker is bonded to the base

The motor leads are ready soldered

The PCB (Printed Circuit Board) is fully assembled

ROBOT ASSEMBLY
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Start by attaching the toe to the base. The top of the base is the side carrying the loudspeaker. Next to the loudspeaker is the slot for the line follower. The toe mounting hole is directly behind it. Turn the base over and run the M4 x 15 mm Countersink screw through the screw fixture, short orange spacer and the base itself. Holding this assembly in place, turn the base over, put on the M4 steel washer and nut. It is not necessary to use pliers or spanners on this nut. As on the remainder of the robot, finger pressure on the nut and firm but careful use of the screwdriver are usually sufficient to assure

sturdy assembly and avoid damage.

Take the white plastic toecap and snap home onto screw fixture now on underside of base.

Now assemble the pelvis section. The gold IGR sticker is on the LEFT side of the pelvis. Peel the paper from the two foam rubber suspension blocks supplied and stick them to the bottom members of the pelvis as in [Fig. 2](#), so that the plastic 'lid' is facing upwards. Now locate the axle through the lower of the two holes in the side of the pelvis and bolt (M3 x 5 mm screws) the axle to the inside of the front face of the of the pelvis using the blue aluminium axle clamp. The groove in the clamp should be towards the base, its two mounting holes towards the top, underneath the large hole for the pen lift cam.

For the sake of neatness, screwheads should be on the outside of the pelvis and nuts on the inside, but the choice is yours.

Ensure that the axle is neither stiff nor very loose in its clamp. If so, drawing and running performance may be adversely affected.

Attach pen lift cam to motor (short lead). The nylon cam is an interference fit on the shaft and the boss on the cam should face towards the motor. Whilst pushing the cam onto the shaft, support its other end on a firm work surface. When the motor shaft, is unsupported, there should be about 1 mm clearance between the cam boss and bearing boss on the motor.

Mount the pen motor complete with cam onto the pelvis, the motor connector facing downwards (M3 x 5 mm screws).

Mount the left hand drive motor (Medium lead) onto the pelvis (M3 x 5 mm screws). Note that its connector should face downwards and the lead be threaded out under the front edge of the pelvis. The motor bearing boss locates snugly in the pelvis side. Hold the motor in position, bolt the rear end of the motor mounting to the pelvis (M3 x 5 mm screws), finger tight only. Now bolt the front end of the mounting to the pelvis. This can be a tight squeeze, but here's a tip: Place the nut on the end of your little finger, tip the side of the pelvis up towards you and locate the nut under the screwhole. Pop in the screw and tighten. Now tighten the rear screw fully.

Repeat the above process for the right hand side motor, noting that its connector faces UPWARDS.

Bolt the assembled pelvis to the base with two M3 x 8 mm screws in the holes immediately behind the rubber suspension blocks.

* Attach the pen clips to the pen slide as shown in [Fig.3](#) (M3 x 5 mm screws) The top of the slide is the end with the cut off corners. Holding the slide by the top clip, take the slide to the pelvis and insert the slide pillars (stepped end down) through the top of the frame, the slide and locate them in holes at the base of the pelvis. Holding this assembly in position, turn the robot over and screw the pillars to the base using the two M4 x 16 mm panhead screws provided. DO NOT OVERTIGHTEN THESE SCREWS. Screw in until the head of the screw touches the base, then no more than 1/8th of a turn.

[* For pen centring, include 2 "Pen Clip Spacers" between top clip and slide - See. Fig.3]

Snap the tyres onto the wheels. Make sure they are not twisted in their grooves. Put a clear plastic spacing washer over each axle stub and push the wheels on afterwards. These should rotate easily on their axles. Push down slightly on each wheel to ease the tyre under the motor boss and push wheel onto spacing washer.

At this point check that an equal amount of axle is protruding beyond the wheel hub on each side of the of the machine. Push on the wheel retainers (star nuts) so that they just touch the wheel hub and allow the wheel to rotate under light finger pressure. (The star nuts are a semi - permanent fixture. If they must be removed at any time, use a

sharp nose pair of pliers to bend out one or two of the 'leaves' and let it drop off the axle. Harm to the axle will result in damage to the wheel bearing on removal unless the score marks on the axle are first removed.)

PCB Assembly

Take the two M4 x 40 mm Phillips panhead screws and the long orange plastic pillars and pass the screws through the two large holes at the top of the PCB (umbilical socket end).

N.B. ON EARLY MODELS, PLASTIC WASHERS ARE SUPPLIED TO INSULATE THE SCREW-LEADS FROM THE PCB - IF THEY ARE SUPPLIED, DO NOT OMIT THEM.

Push the orange pillars over the screws and carefully locate the line follower LED/transistor array at the bottom of the board in the slot provided in the base. Now bolt the two mounting screws to the pelvis via the holes at top right and left of the pen motor.

Attach the loudspeaker wires to the two pins provided at the rear of the PCB. Attach the pen motor connector to the lower of the two pin headers on the left hand side of the board at rear. The left hand motor connects to the top header on this side. The right hand motor connects to the only header provided at the rear on the right hand side of the board. As a rule, latched cable connectors should be fitted with the latch facing outwards, but no damage can occur if the connector is fitted the wrong way round. However, the motors would go backwards instead of forwards and vice-versa if connected wrongly!

Locate the shell on the top of the two slide pillars protruding at the top of the pelvis and attach by four nylon M3 x 8 mm screws and nuts around the edge of the base.

Now you should turn to your ZERO 2 Instruction Manual where directions are given for connecting up the robot to your computer.

If as a kit builder you do not buy the interface and/or power supply separately, but make/supply them yourself, make sure that the power supply delivers a smoothed offload output of 15 - 20V DC and has a capacity of not less than 1000 mA. The ZERO 2 Power Supply is rated at 1400 mA to allow for add-ons you may buy or make yourself. If and when you do up grade, it is a worthwhile acquisition.

Circuit Board Layout and Diagrams are included at the back of the ZER02 instruction manual.

If you are short of parts or in need of one or two replacement fasteners for example, please contact your supplier.

Figure 1

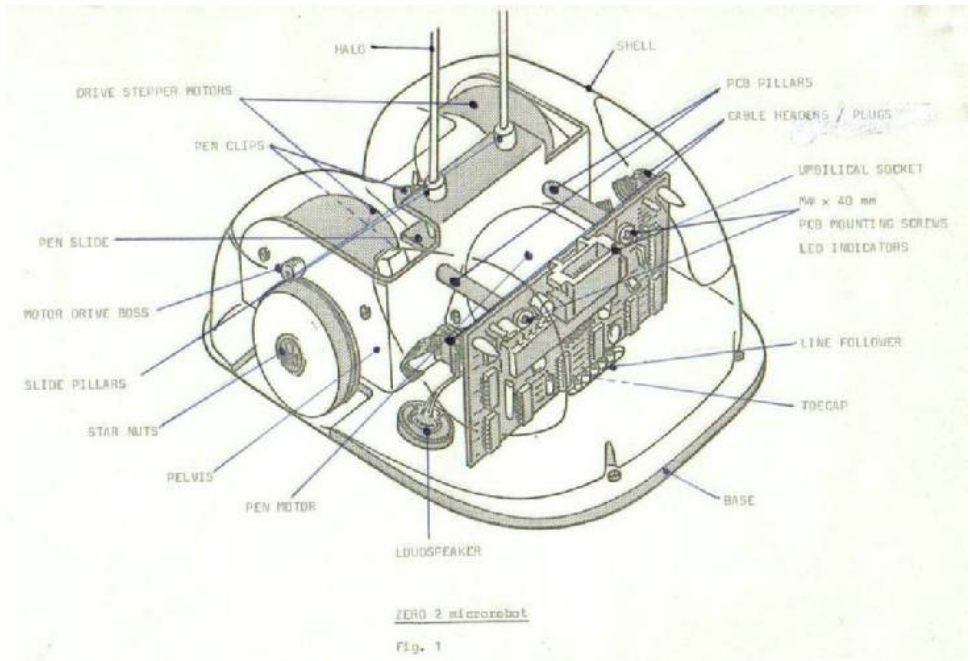


Figure 2 - Location of Axle spring-rubbers

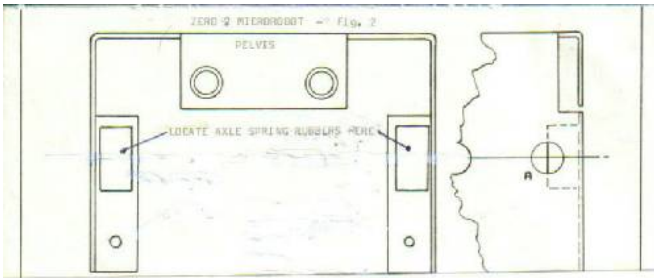


Fig. 3.

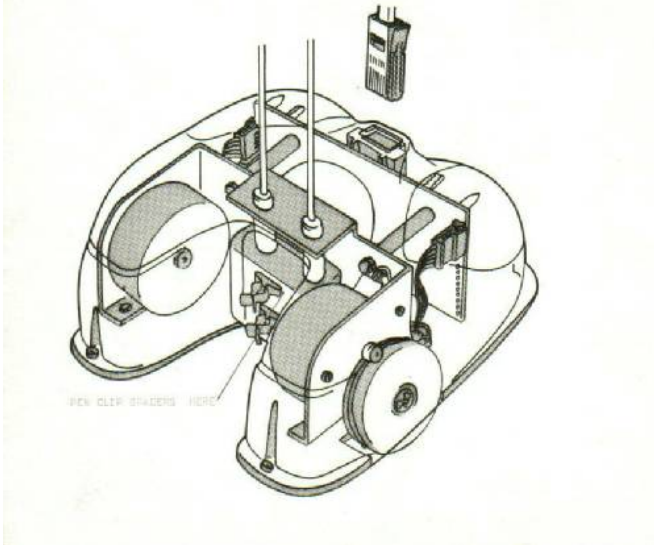


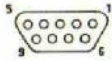
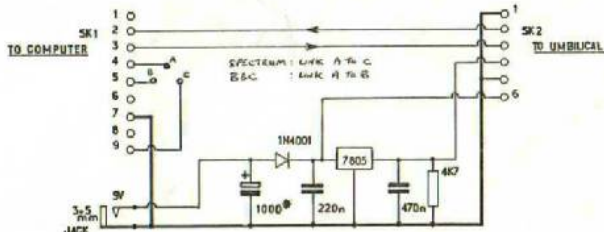
Figure 3 - Location of Pen Clip spacers under top clip

ZERO 2 PARTS LIST

Part No	Qty	Description
Z2-1	1	Base Plate
Z2-2	1	Body Shell
Z2-3	1	Motor Frame (Alu)
Z2-4	1	Pen Slide
Z2-5	1	Axle Clamp
Z2-6	1	Axle
Z2-7	2	Slide Pillars
Z2-8	2	Wheels
Z2-9	2	Tyres
Z2-10	1	Toe Pillar
Z2-11	1	Toe Slide
Z2-12	3	Motors
Z2-13	1	Cam Pen Eff
Z2-14	2	PCB Pillars
Z2-15	10	M3 x 6 screw steel
Z2-16	2	M3 x 8 screw steel
Z2-17	12	M3 nuts steel
Z2-18	2	M4 x 40 screw Pillar Pen steel
Z2-19	2	M4 x 16 screw Pen steel
Z2-20	1	M4 x 15 screw c/rk steel
Z2-21	3	M4 nuts steel
Z2-22	4	M3 x 8 screw pen nylon
Z2-23	4	M3 nuts nylon
Z2-24	4	Spring Washer

Part No	Qty	Description
Z2-25	2	Star Nut 3mm
Z2-26	1	Cable Support (Main)
Z2-27	2	Wheel (Rubber) Spring Washer
Z2-28	2	Axle Spring Rubber
Z2-29	2	Drive Boss
Z2-30	2	Penclips
Z2-31	1	Vehicle PCB
Z2-32	1	M4 washer steel
Z2-33	1	Speaker

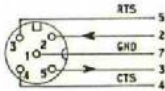
Zero2 Interface



SPECTRUM 3-PIN
REAR (SOLDER SIDE) VIEW



UMBILICAL



BBC 5-PIN

* ONLY REQUIRED IF
POWER SUPPLY NOT
SMOOTHER

ZERO 2 INTERFACE

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REM 7.4.85

For annotated diagram see [diagram on main Zero2 page](#)