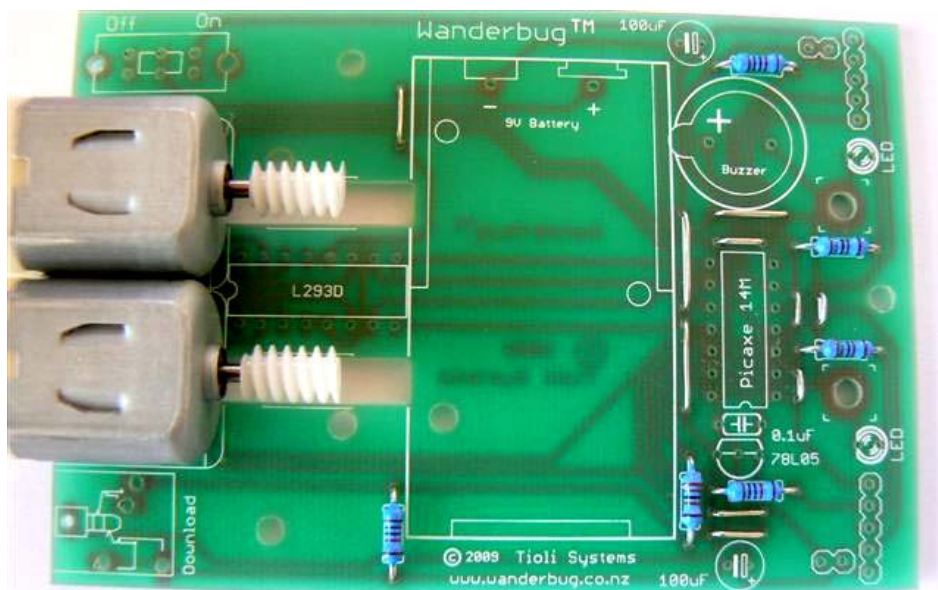


## Wanderbug Assembly Instructions

1. You will need:

Soldering iron, solder, long nose pliers, side cutters, posidrive or Philips screwdriver

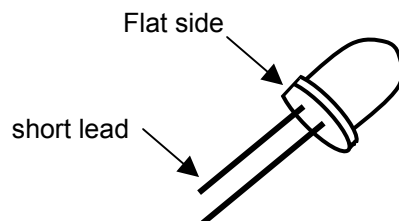
2. Solder the six resistors in place in the correct places. The values must match the value printed on the board. The value can be found from the first 3 bands on the resistor. 22k $\Omega$  is red-red-orange (there is 1 of these), 1.5k $\Omega$  is brown-green-red (there are 2 of these), 10k $\Omega$  is brown-black-orange (there are 3 of these). They can be either way around. Snip off the excess leads and save these for the jumpers.
3. Using the excess resistor leads solder the ten jumpers in place and snip off the excess leads. The photo below shows the board at this stage.



6 resistors in correct places according to marked values

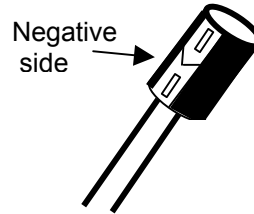
10 jumpers made from snipped off resistor leads

4. Solder the 16 pin IC socket in position between the two worm gears. The dimple must face the motor end of the board.
5. Solder the 14 pin IC socket in the position marked "PICAXE 14M". The dimple must face away from the buzzer.
6. Solder the LEDs in place. The short lead (and the flat side on the flange, if there is one) must face towards the motors. Snip off the excess leads.

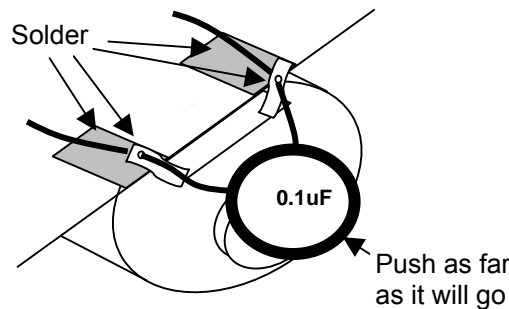


7. Solder the 78L05 regulator in place according to the outline on the circuit board. Snip off the excess leads.

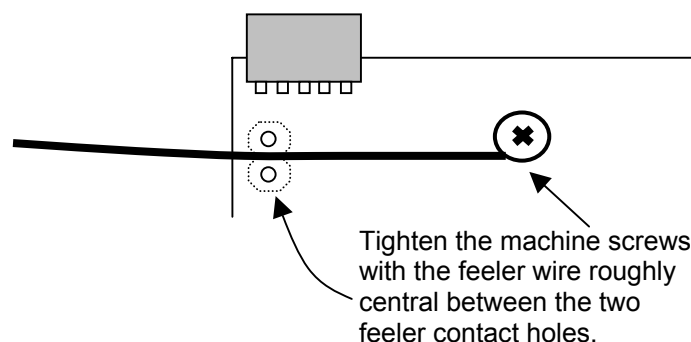
8. Solder one of the three 0.1uF capacitors in place between the 78L05 regulator and the Picaxe 14M IC socket. This can be either way around. Snip off the excess leads.
9. Solder the two 100uF electrolytic capacitors in place. The negative side must be towards the motors. Snip off the excess leads.



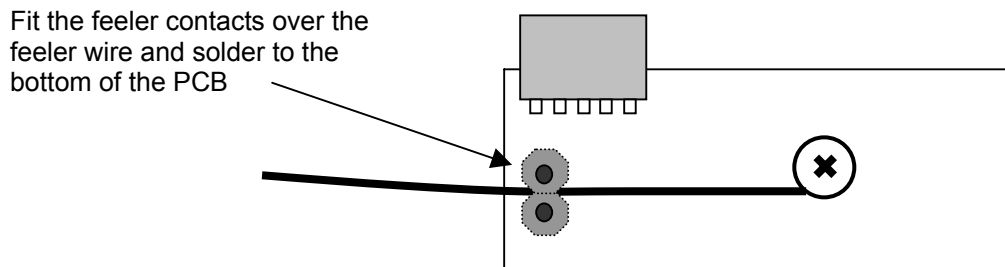
10. Solder the buzzer in place. The positive side must be towards the motors. Snip off the excess leads. Remove the paper cover.
11. Solder the switch and download socket in place on either side of the motors.
12. Connect the motors using the remaining two 0.1uF capacitors. Using the long nosed pliers, twist the motor tabs so that the capacitor leads can pass through them and onto the rectangular solder pads on the PCB. Push the capacitor leads through as far as possible, solder them both to the PCB pads and the motor tabs. Snip off the excess leads.



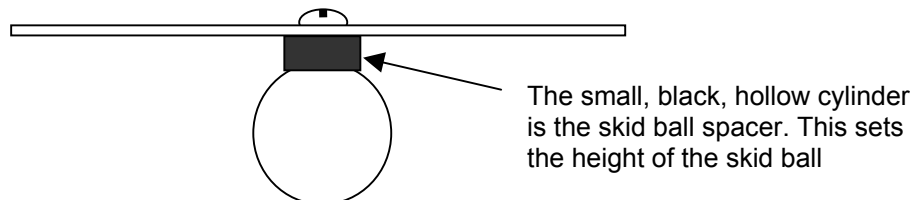
13. Solder the upgrade sockets at the front. These are 5-pin header sockets which point forwards to take further modules. They should be fitted hard against the PCB surface. Snip off the excess leads.
14. Fit the feeler wire using the small machine screws and nuts. The feeler must go on top of the PCB, under the head of the machine screw. The nut goes on the bottom. Using the posidrive screwdriver and pliers to hold the nut, position the feeler wire so it is between the holes of the feeler contacts, which have not yet been fitted. Tighten in this position.



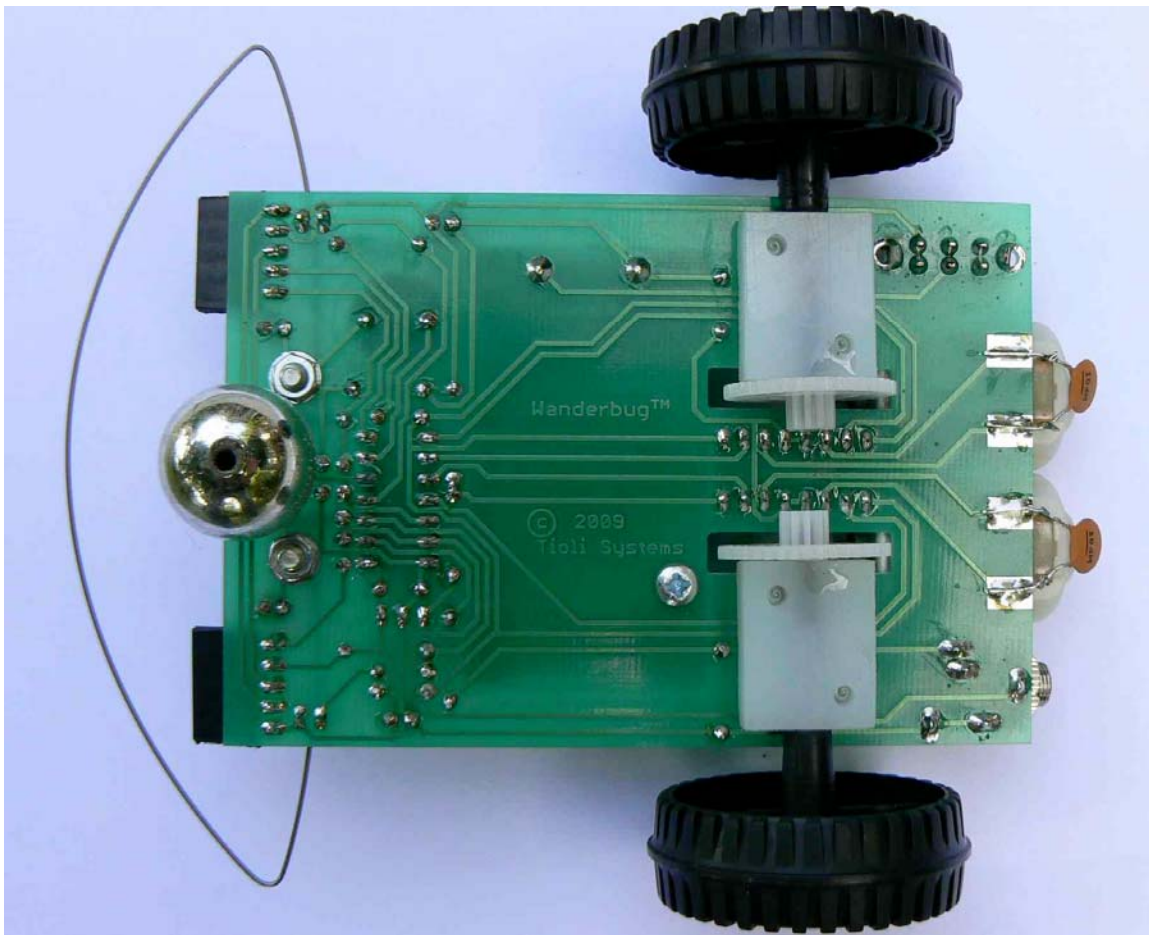
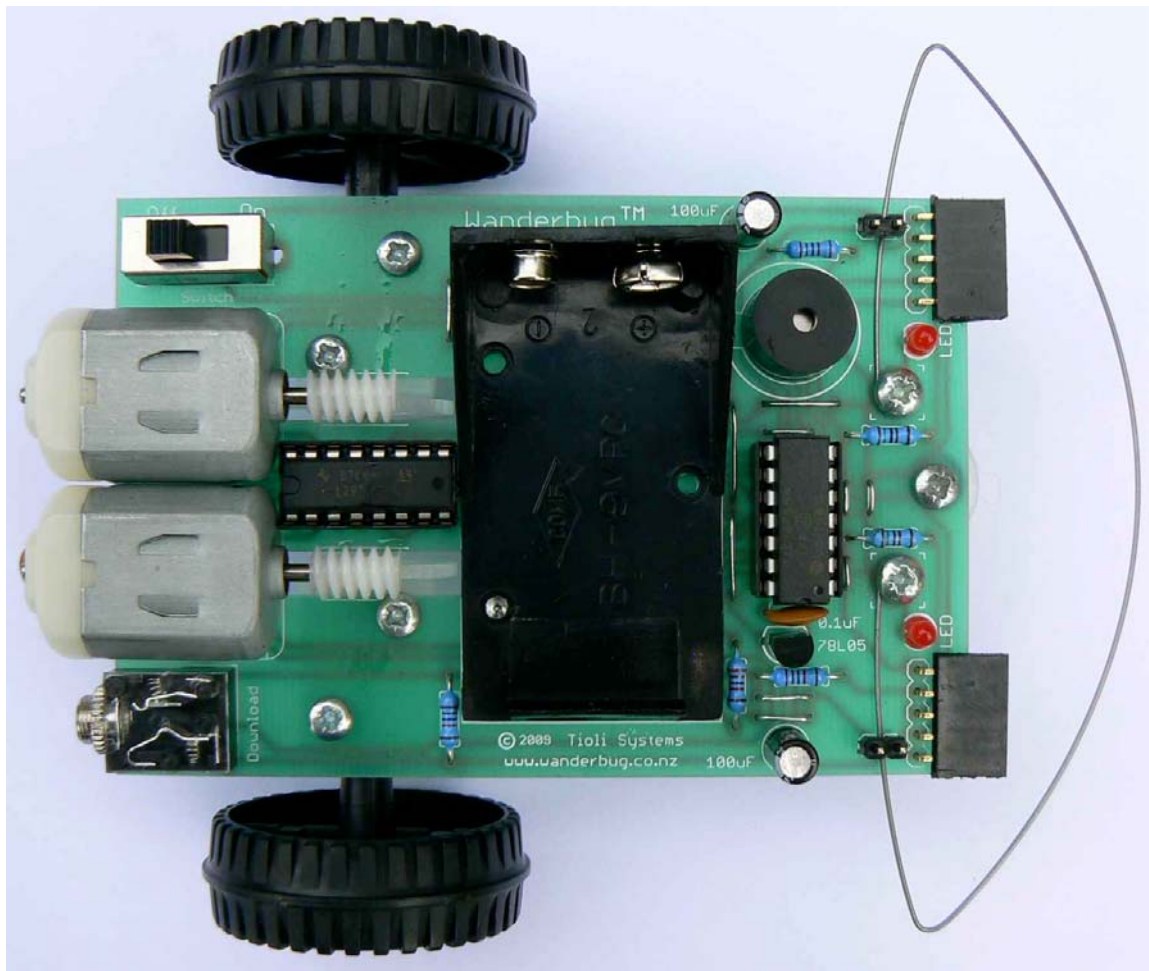
15. Fit the feeler contacts over the feeler wire from the top of the PCB. They only need to protrude through the board enough to solder them in place. If the feelers need to be removed later, the black plastic part of the feeler contacts can be slid up and off.



16. Solder the battery holder in place and snip off the excess leads. Screw a small self-tapping screw in from the bottom of the PCB to hold the battery holder in place.
17. Screw the wheel assemblies in place using the remaining four small self-tapping screws. Care must be taken that the spur gear meshes with the worm gear as the screws are tightened. Check the backlash. This is the small clearance between the gears that allows for their free turning. There should be about 0.1mm, just enough to see. Tighten until the bearing block is tightly snug against the bottom of the PCB. Do not over-tighten. To ensure some backlash the inner screws can be loosened slightly. Add a little oil to the gears and axle for smooth running.
18. Fit the skid ball and skid ball spacer to the front of Wanderbug™, using the one longer self-tapping screw. Tighten until firmly attached.



19. Fit the chips into the IC sockets, ensuring that the dimples at the end of the chip are at the same end as the dimples on the IC sockets and PCB marking. Take care that all the pins are aligned with the pin socket before pressing home. If the pins appear to be slightly spread, they can be gently squeezed together until they are parallel.
20. Check your work with the photos on the following page:



21. Fit a good 9V battery and turn on the switch.

Both motors should run in a forward direction.

When the right feeler touches its contact:

The right motor should stop  
The left motor should reverse  
The right LED should light  
The buzzer should sound

When the left feeler touches its contact:

The left motor should stop  
The right motor should reverse  
The left LED should light  
The buzzer should sound

## Adjustments

1. **Feelers** The feeler wire has been bent to allow the feeler to sit approximately between the feeler contacts when screwed in place. By moving the feeler towards the front contact (or hard up against it) the feeler becomes less sensitive. By moving the feeler towards the back contact, without touching it, the feeler becomes more sensitive. If it is necessary to adjust the bend on the feelers, they can be removed by sliding the black plastic part of the feeler contact off the pins and unscrewing the feeler wire. The bend on each side can now be decreased (less sensitive) or increased (more sensitive).
2. **Backlash** If there is some binding between the spur gear and the worm gear (they don't run freely all around), a piece of paper between the bearing block and the PCB will shim a little more backlash clearance into the mesh.

## Trouble shooting

What to look for if Wanderbug™ does not perform all functions in step 21.

1. Check that all parts have been fitted correctly. Especially check that the chips are the correct way around and that all pins on each chip are properly plugged into the IC socket. If one is bent under it can be difficult to see without removing the chip.
2. Check all solder joints. Make sure that the solder has formed a complete join and is not just sitting on top. Check that solder has not jumped to another pad where it is not intended to be.
3. If Wanderbug™ does not travel in a reasonably straight line across a smooth floor, check that there is sufficient backlash clearance in both gear assemblies. Adjust the backlash if necessary.

### Wanderbug Parts List

Item No.	Qty	Description
1	1	PCB, motors, worms
2	1	Resistor 22k
3	2	Resistor 1.5k
4	3	Resistor 10k
5	1	IC socket 14 pin
6	1	IC socket 16 pin
7	2	3mm LED
8	1	78L05 Voltage regulator
9	3	Ceram. caps 0.1uF
10	2	Elect. Caps 100uF
11	1	Buzzer
12	1	Switch
13	1	Download socket
14	2	5F Pin Header
15	1	0.7mm Feeler
16	2	Wheel, axle, spur, bearing
17	1	9V battery holder
18	1	skid ball
19	1	L293DNE
20	1	Picaxe 14M2
21	5	small screws
22	2	machine screws
23	2	nuts
24	1	large screw
25	1	skid ball spacer
26	2	2M pin header