

## NOTICE

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## Introduction

The KBOT-1 kitset is an Advanced Project and has a large number of components. It requires good soldering skills, careful handling of static sensitive components, and care in correctly placing components. The Tamiya motor/gearbox assembly and ball castor also need assembly. If you do not feel confident enough to assemble the kitset yourself Kiwacan offers an assembly services for a small fee, and also pre-assembled units.

The following instructions are a step by step guide to assembling the KBOT-1 printed circuit boards. The motor/gearbox and ball castor assembly instructions are supplied with those items.

## Before Starting

Please check that all of the components are included and in there correct quantities. If something is missing then please contact Kiwacan immediately. If you have extra parts, consider them a bonus. The part lists are further in this documentation.

Being a kitset Kiwacan cannot guarantee the workmanship or components after assembly. If you cannot get it to work Kiwacan offers a repair service for a fee. If components are found to be faulty they will be replaced free of charge.

## Tools you will need

- Small side cutters
- Fine long nose pliers
- Fine soldering Iron
- Small flat head screw driver
- Small adjustable wrench
- Craft knife

# Parts List

## KBOT-1 MAIN BOARD

<i>Part Type</i>	<i>Qty</i>	<i>Designator(s)</i>	<i>Description</i>
<b>RESISTORS</b>			
2R2	1	R1	2R2 0.2" Resistor
10K	20	R2-R19, R29,R30	10K 0.2" Resistor
1K	2	R20,21	1K 0.2" Resistor
330R	7	R22-R28	330R 0.2" Resistor
<b>CAPACITORS</b>			
0.1uF	8	C1-C7, C14	0.1uF 0.1" Mono Cap
100uF	1	C8	100uF 16 V 0.1" Electro
<b>SEMICONDUCTORS</b>			
5V1	1	ZD1	5.1V 1W Zener Diode
1N4007	1	D1	1N4007 1A Diode
PIC12F675	1	IC1	Microchip PIC12C675
L293D	1	IC2	L293D H-Bridge motor Driver
PIC16F627/628	1	IC3	PIC 16F627/628
LM358N(8)	1	IC4	Dual Operational Amplifier
RED LED	1	LED1	Red 5mm Diff 120MCD
YELLOW	1	LED4	Yellow 5mm Diff 100MCD
BC547	2	Q1,Q2	NPN Transistor
<b>SWITCHES</b>			
POWER	1	S1	Toggle Switch
SW DIP-8	1	SW2	DIP Switch
OPTO MODE	1	SW3	DIP Switch
Bump Switches	3	SW4-SW6	Microswitch
<b>CONNECTORS</b>			
Screw Terms	4	CN1,CN2,CN11,BT1	Screw Terminal 0.2"
Serial Module.	1	CN12	PCB IDC10 Sock
AN2	1	CN7	SIP1
RESET	1	SW7	SIP2
Servo	3	CN8-CN10	SIP3
I2C	1	CN13	SIP4
ICSP	1	CN5	SIP5
6 Way Connectors	2	CN3,CN4	SIP6
<b>MISC</b>			
Battery Holder	1		4 x AA Battery Holder
Battery Snap	1		Battery Snap to suit above
DIP 8 Socket	2	IC1,IC4	DIP8 Socket
DIP18 Socket	1	IC3	DIP18 Socket
DIP16 Socket	2	IC2,IC5	DIP16 Socket
Main PCB	1		KBOT-1 Main PCB
M3x12 Screws	6		M3x12 Machine Screws
M3 Nuts	12		M3 Nuts
5mm Heatshrink	1		5mm Heatshrink x 40mm (Optics)
24SWG Wire	1		22SWG Wire – 200mm for links
20MM Standoff	4		20mm Standoffs for battery

## SERIAL MODULE

<i>Part Type</i>	<i>Qty</i>	<i>Designator(s)</i>	<i>Description</i>
MAX232	1	IC5	MAX232A
RS232 SERIAL	1	CN15	D9 R/A PCB Socket
HEADER 5X2	1	CN14	PCB IDC10 Pins
0.1uF	5	C9-13	0.1uF 0.1" Mono Cap
Serial Mod PCB	1		KBOT-1 Serial Module PCB

## OPTICAL SENSORS

<i>Part Type</i>	<i>Qty</i>	<i>Designator(s)</i>	<i>Description</i>
PNA1801/PN168	2	Q3,Q4	PN168 Photo Transistor
RED LED	2	LED2-LED3	Red 5mm Diff 120MCD
6 Way Connectors	1	CN6	SIP6-Socket
Optic PCB	1		KBOT-1 Optic output PCB

## EXTRA PARTS

(Have there own Assembly instructions)

<i>Part Type</i>	<i>Qty</i>	<i>Designator(s)</i>	<i>Description</i>
Tail Castor	1	BC1	Tamiya Ball Castor
Dual Motor Kit	1		Tamiya Dual Motor/Gearbox Kit
Wheels	2		Wheel Set for Gearbox

# Quick Instructions

(For Experienced People)

- Step 1: Bend, insert and solder the Links as marked on PCB
- Step 2: Resistors
- Step 3: Diodes
- Step 4: I.C. Sockets
- Step 5: Capacitors
- Step 6: Transistors and LED's
- Step 7: DIP Switches
- Step 8: Pin type connectors
- Step 9: Screw Terminals
- Step 10: Micro-switches
- Step 11: I.C's
- Step 12: Assemble other PCB's (Sensor/RS232) and the Gearbox assembly
- Step 13: Mount Motor/Gearbox assembly to PCB.
- Step 14: Mount Ball and Castor
- Step 15: Mount Battery
- Step 16: Attach Sensor.
- Step 17: Upload test program.

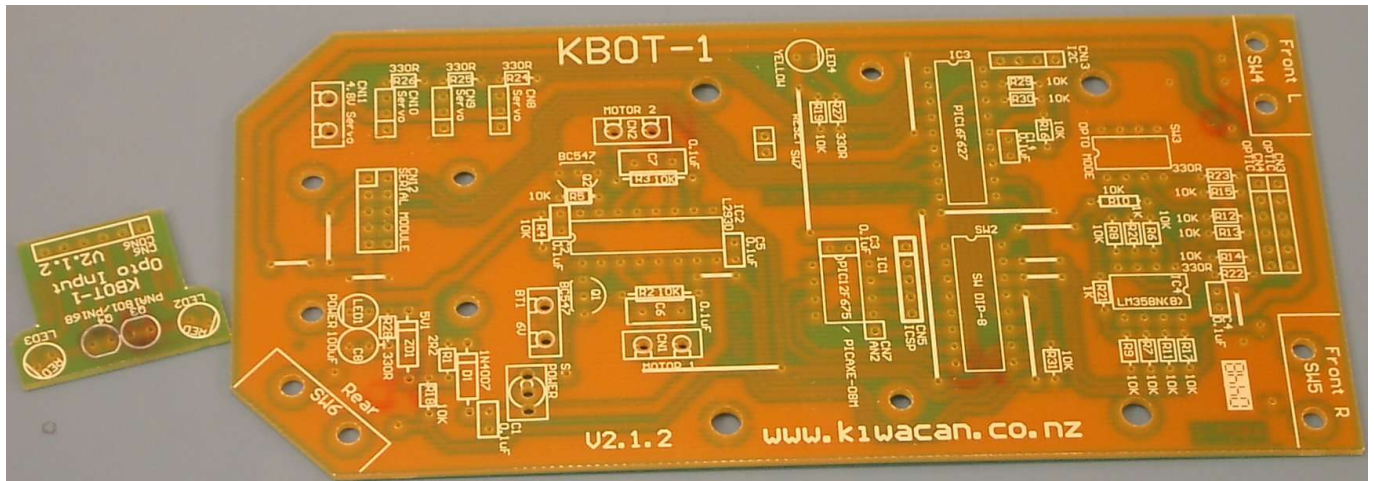


Figure ??: Bare Boards

# Main PCB Assembly

## Step 1: Links

Using long nosed pliers, bend 3mm at each end of the above wires this should give you links as shown in figure 1.

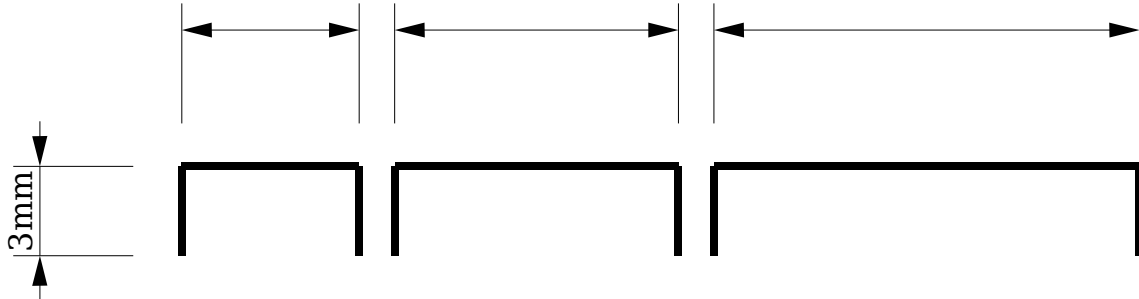


Figure 1.

Insert the links into the positions as indicated in figure 2.  
Turn the PCB over, solder the leads.  
Using sidecutters remove any access wire.

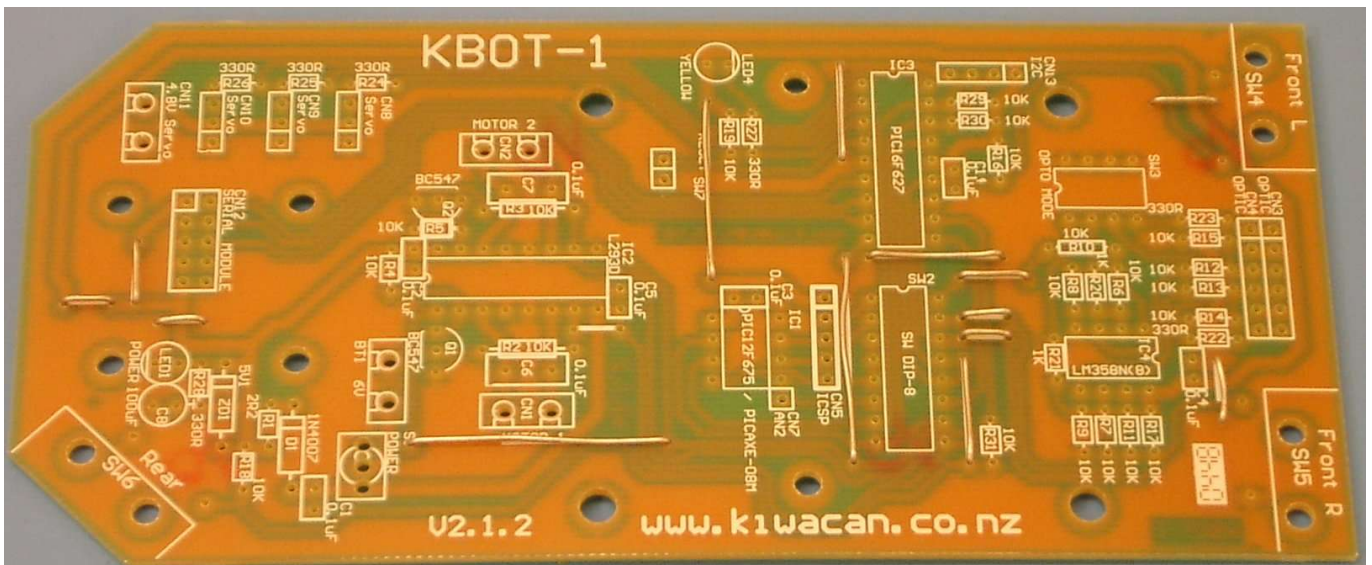


Figure 2: Links

## Step 2: Resistors

Fold and insert all 10K Resistors (Note: R2 and R3 are wider lead spacing)

Fold and insert all 1K Resistors

Fold and insert all 330R Resistors

Fold and insert all 2R2 Resistors

Solder then trim leads.

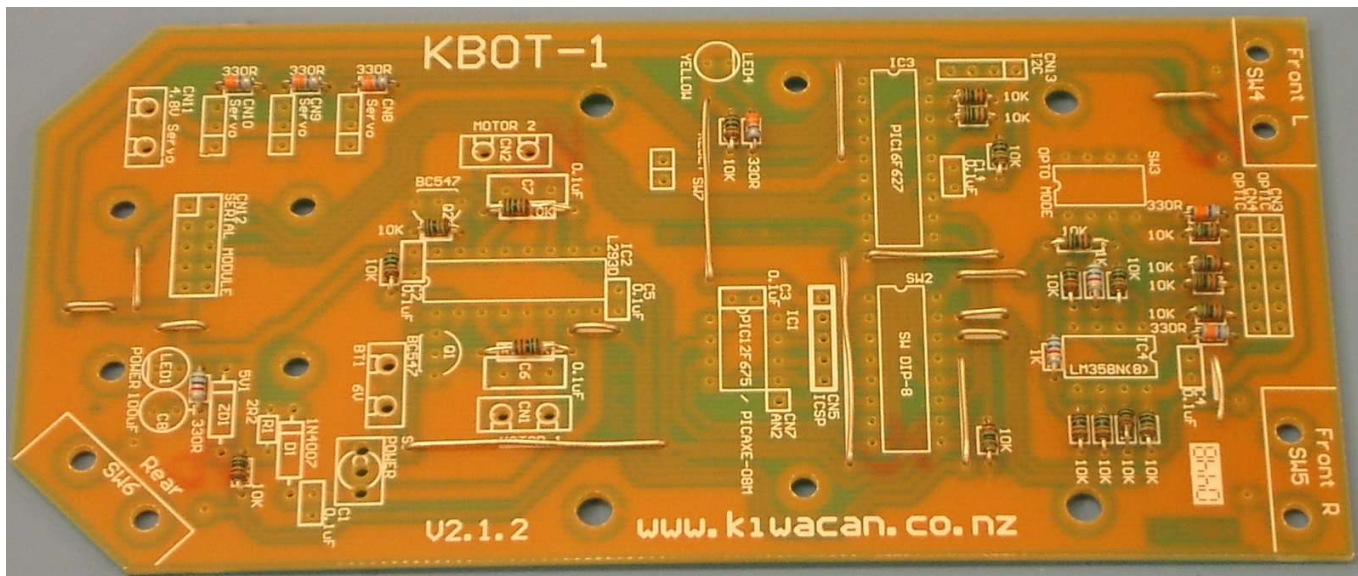


Figure ??: Resistors

## Step 3: Diodes

Fold and insert D1 and ZD1

Solder then trim leads.

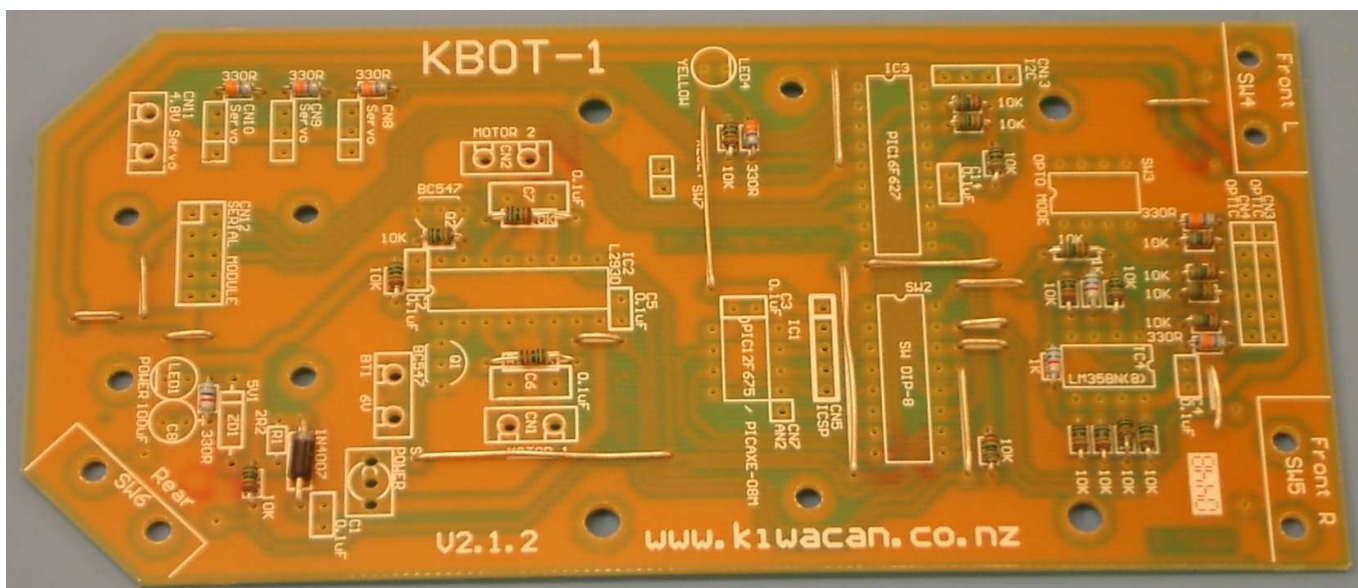


Figure ??: Diodes

### Step 4: IC Sockets

Make sure all notches match that on the drawing.  
Insert 8 pin DIP sockets in IC1 and IC4 positions and solder.  
Insert 16 pin DIP socket in IC2 position and solder.  
Insert 18 pin DIP socket in IC3 position and solder.

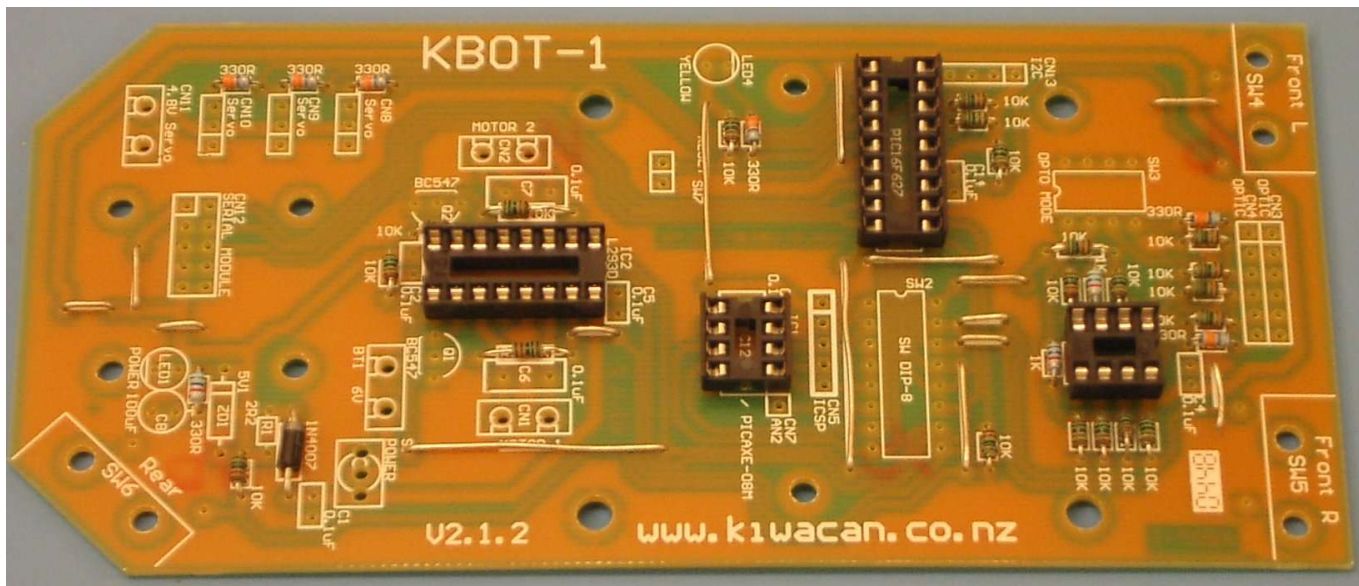


Figure ??: IC Sockets

### Step 5: Capacitors

Insert C1 to C7 and C14 (Note: C6 and C7 are wider lead spacing)  
Solder then Trim Leads

Insert C8 making sure the +ve Lead is next to R28 (-ve Lead closest to large hole)  
Solder then trim leads.

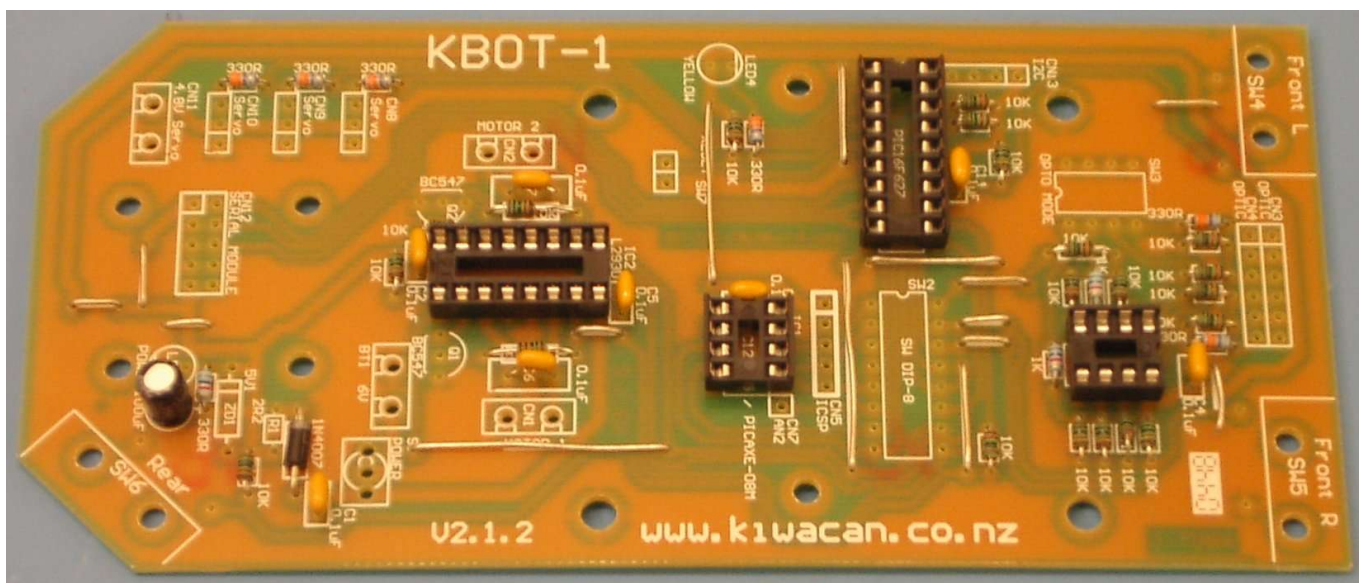


Figure ??: Capacitors



## Step 8: Pin Connectors

Using side cutters carefully cut the following number of pins from the strip provided.

- One 1 way
- One 2 Way
- Three 3 way
- One 4 way
- One 5 Way
- One 6 Way

Insert the 1 way into CN7 then solder.  
Insert the 2 way into SW7 then solder.  
Insert the 3 way into CN8, 9 and 10 then solder.  
Insert the 4 way into CN13 then solder.  
Insert the 5 way into CN5 then solder.  
Insert the 6 way into CN4 then solder.

Insert the 6 way right angled pins into CN3 and solder.

Insert the 10 Way Socket into CN12 with the slot closest to the PCB edge and solder.

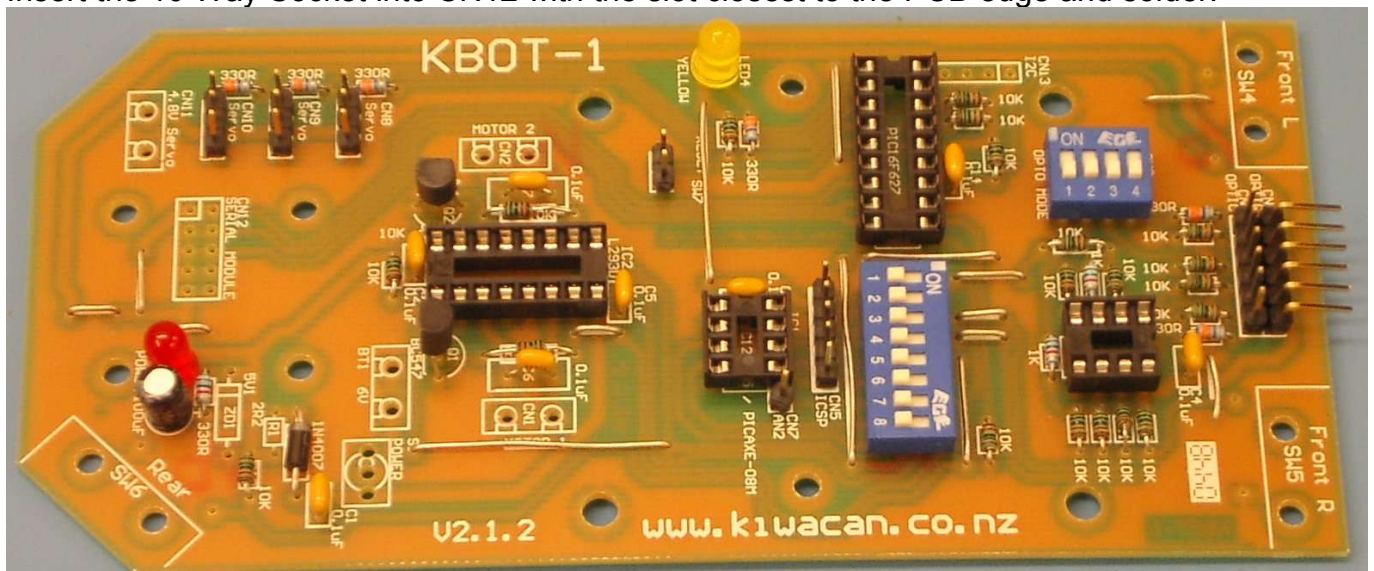


Figure ??: Pin Strips

## Step 9: Screw Terminals

Insert BT1 so wires can insert from rear of PCB then solder.  
 Insert CN1 so wires can insert from side of PCB then solder.  
 Insert CN2 so wires can insert from side of PCB then solder.

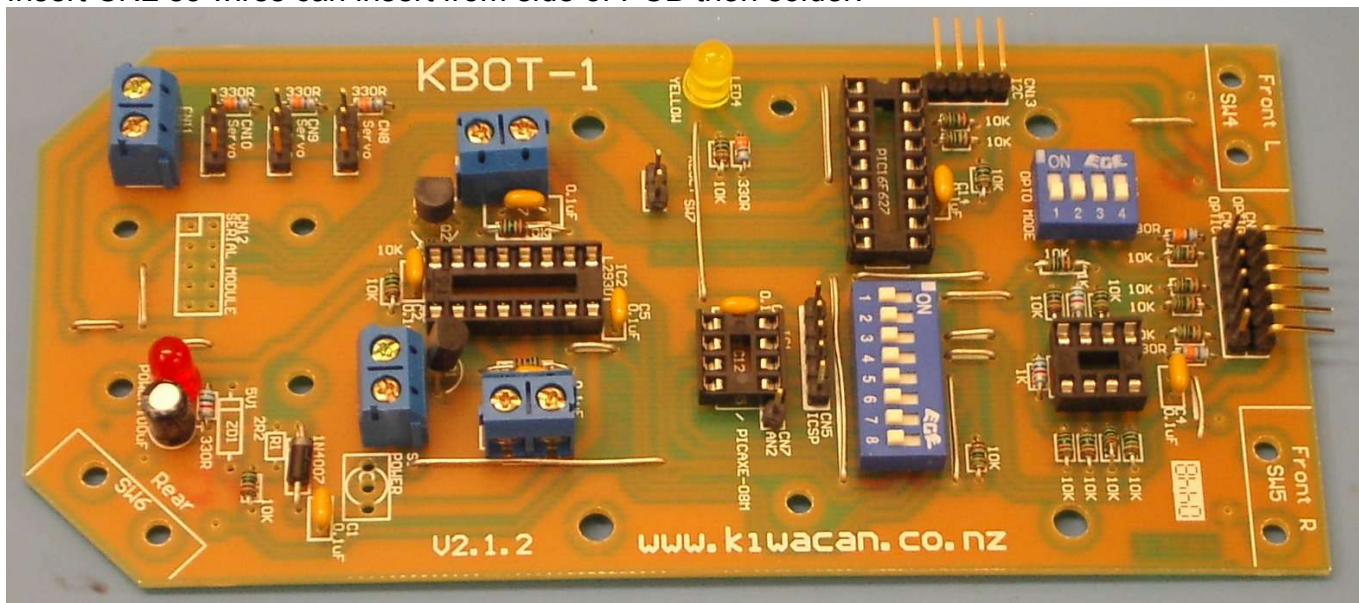


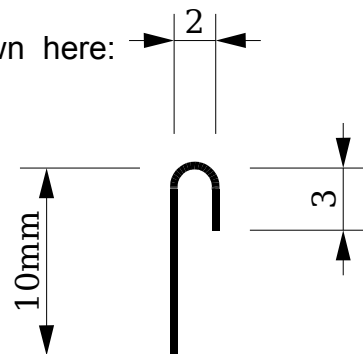
Figure ??: Screw Terminals

## Step 10: Switches *(NOTE: THIS MAY NEED REWRITING DEPENDING ON ACTUAL SWITCHES)*

Insert the toggle switch into S1 position. Solder.

Using the remaining tinned copper wire provided cut Six lengths at 15 to 20mm each.

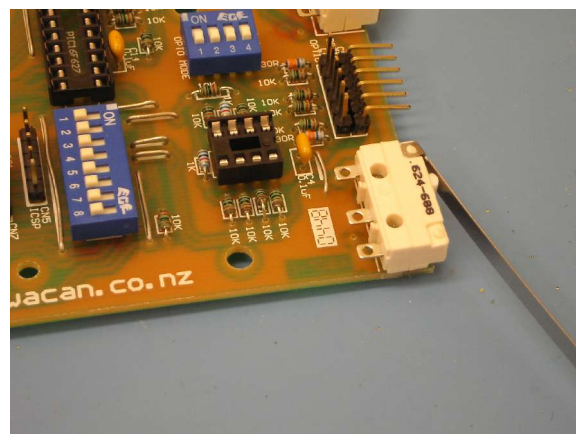
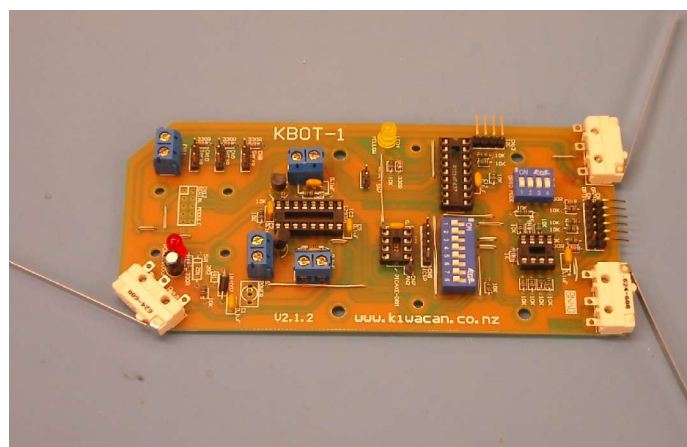
Make a loop in one end the wires of approximately 2-3mm as shown here:  
 These will be used to connect the microswitches to the PCB.

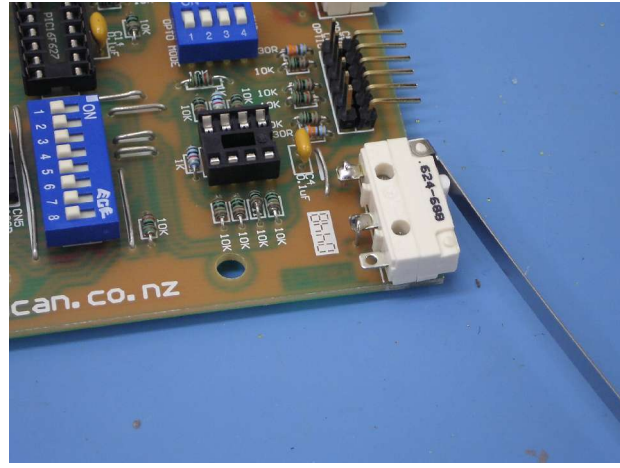
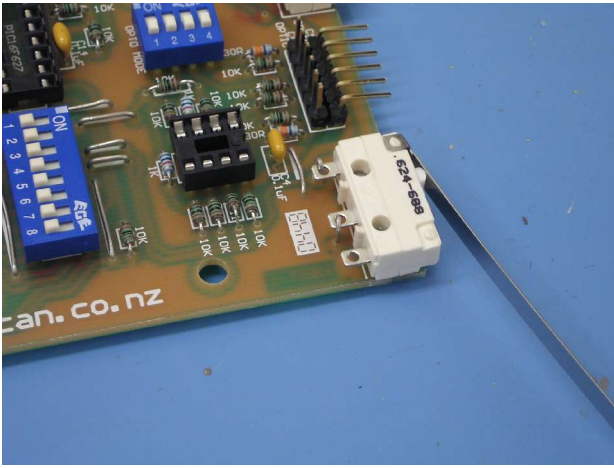


Using the self tapping screws provided, screw the three microswitches to the PCB as shown on the overlay.

Now the tricky part. From the top side of the PCB push the straight part of the hoop through the PCB and put the hook over the pin sticking out of the microswitch. Solder the hoop onto the microswitch, then turn PCB over, solder and trim. Repeat.

Note: Only the END pins of the microswitches are used.





### Step 11: Integrated Circuits

Insert the LM358 8 pin IC into IC4 socket.

Insert the L293D 16 pin IC into IC2 socket.

Insert the PIC12F675 8 pin IC into IC1 socket.

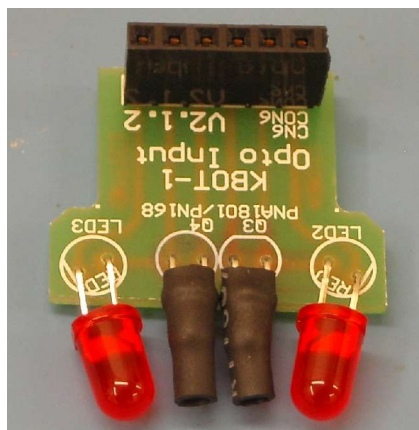
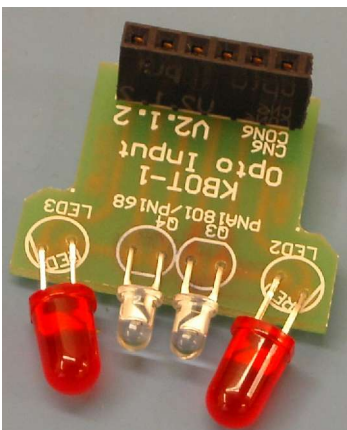
The PIC16F627 (IC3) is an upgrade option. Only insert if the PIC12F675 has been programmed specifically for the upgrade operation as it shares some control lines and if used incorrectly could damage both micro-controllers.

### Step 12: Assemble Other Units

Assemble the Gearbox using the separate assembly instructions.  
(Recommend using 58:1 ratio in the center position)

Assemble the Ball Castor using separate assembly instructions.  
(Recommend using the 26mm Height option)

Assemble the Optical input PCB as per instructions later in this document.  
(May be pre-assembled)



### *Step 13: Mounting the Motor/Gearbox to PCB*

Solder the figure-8 insulated wire provided to the motors.

Push the wheels onto the end of the gearbox shafts

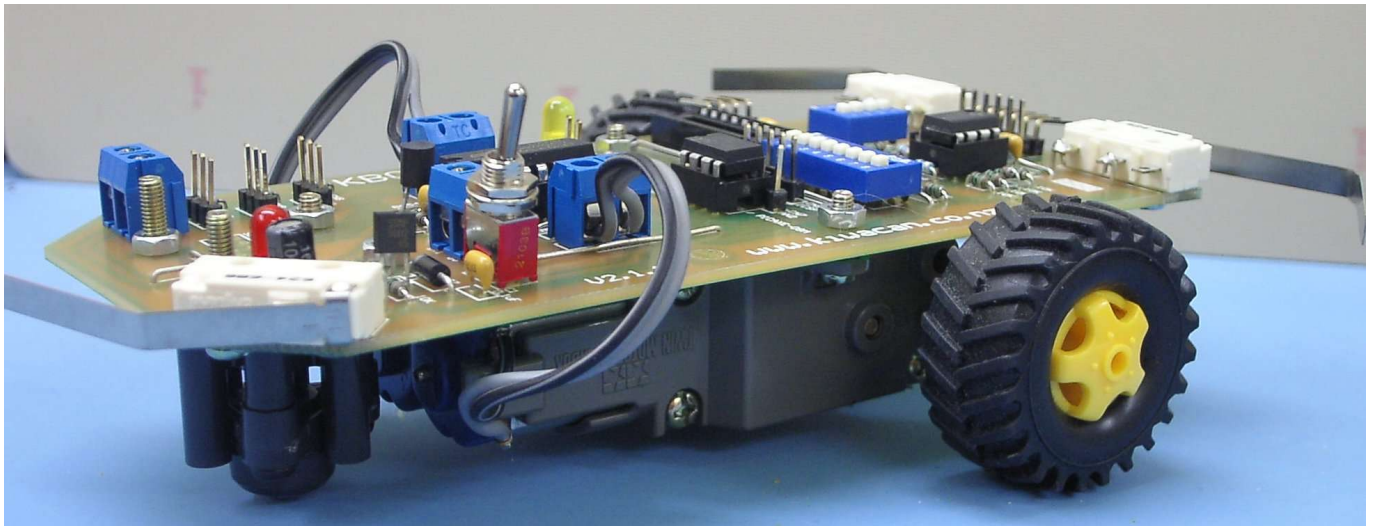
Place two M3 machine screws through the tabs on the gearbox. Use M3 nuts and finger tighten so screws still move a little.

Place assembled PCB over gearbox as shown so that screw position is adjusted correctly.

Tighten the M3 Nuts to hold screws in place.

Place two more M3 nuts and tighten to lock motor assembly to PCB.

Insert other ends of motor wires into screw terminals.



### *Step 14: Mounting Ball Castor*

Place the ball castor on the underside of the PCB, and using M3 Screws and nuts bolt it on.

The platform should now be able to stand by itself.

## Step 15: Mounting the Battery

Modification of the self adhesive standoffs may be required.

Trim the pointed ends using a craft knife, or side cutters to look like the following photo.

Once done, inset the pointed ends into the PCB.

Remove the adhesive protectors

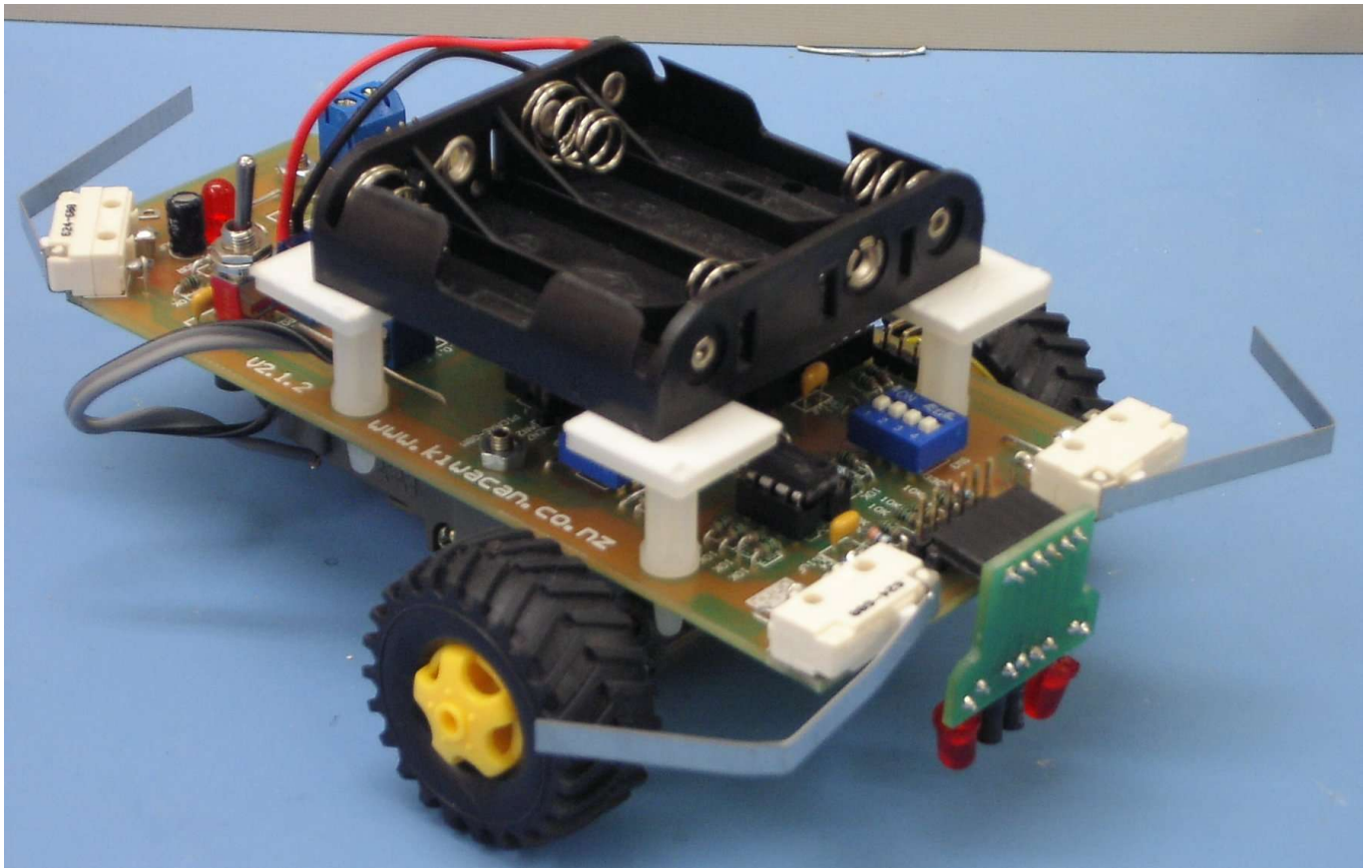
Place the battery holders smooth side onto the adhesive side as shown.

If you pull the battery up it should bring the stand offs with it.

Make sure the adhesive has stuck by pressing the standoffs toward the holder.

You now have an easy to install/remove battery holder.

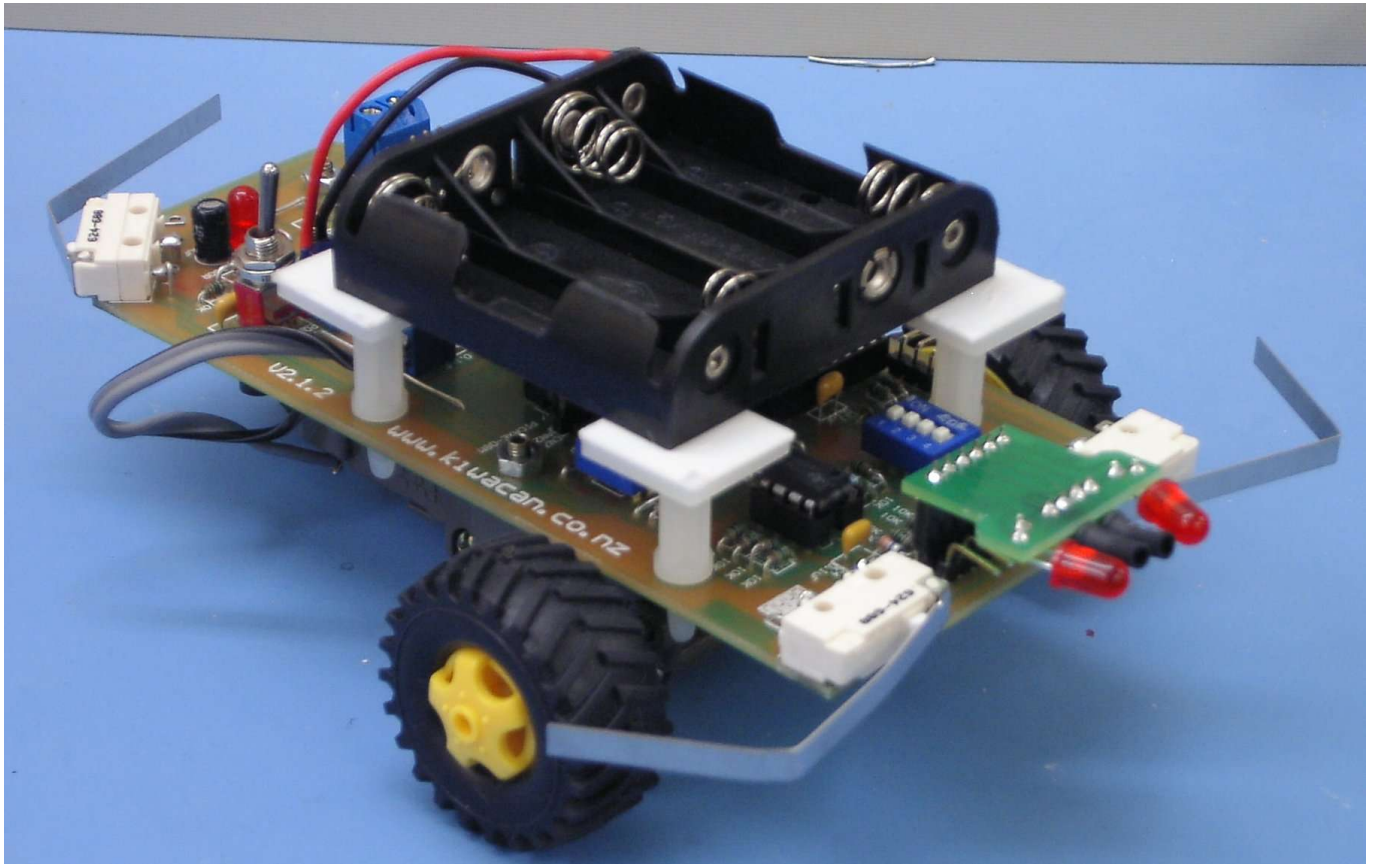
If a battery snap is provided, screw the leads into BT1 terminal as shown, and then attach to battery pack. Otherwise screw the leads from the battery pack directly into BT1.



### Step 16: Attach the sensor

as you will notice there are two connectors at the front of the robot, one upright and the other horizontal. This allows the robot to be configured for line or light chasing.

If you plug the optical sensor PCB on so that the LED's and sensors face the floor then it will be ready for line chasing. Otherwise it will be ready for light chasing.



You now have an assembled robot.

The PIC12F675 may be programmed with the line chase sample code for testing.