FUTURE KIT ®

HIGH QUALITY ELECTRONIC KITS

PIC1 OBSTACLE-AVOIDING ROBOT
CODE 1111   LEVEL 3

This robot will start moving whenever the sensor detects any obstacles and can avoid them. With it's built-in PIC microcontroller. The user can re-write any program for getting new applications.

Technical Specifications:
- Power supply : 4 AA batteries (not included).
- Consumption : 80mA.
- PCB dimensions : 2.54 x 1.18 in. (sensor board)
  2.54 x 2.60 in. (control board)

(1) ROBOT CONTROL CIRCUIT
How To Work:

The circuit is composed of 2 major parts, sensor board and control board, as shown in Fig. 1.

Sensor board have 3 sets, in set as transmitter and receiver of infrared light. Transmitter part is consist TR4 and LED INF. VR4 is used for adjust the level of infrared light. Receiver part, when photo-transistor received infrared light from LED INF, causing voltage being passed through. The more reflected light will lessen the internal resistance and give bigger passing through voltage. Less reflected light will enlarge the internal resistance and give less passing through voltage. TR1 to TR3 will work when the photo-transistor received infrared light.

Control board, at the heart of the circuit is the PIC microcontroller IC1. When photo-transistor is not receiving infrared light, TR1 to TR3 are not working. IC1 will send the voltage to pin 5 and pin 9, causing both motor is running forward. If some photo-transistor received infrared light,

motor is running backward. IDE port is used for connect AVR programmer.

Circuit Assembling:

The PCB will be divided into two boards, PIC1-1 for circuit controlling and Body set for body, motor gear, wheel and battery holder assembling.

The PIC1-1 circuit assembling has been shown in Fig 2. It is recommended to assemble the circuit starting with a less height component i.e. diodes, resistor, electrolytic capacitors and transistors etc. Be careful while assembling and check for the matching of PCB poles and components before soldering as shown in Fig 3. For IDE port, press the pin of IDE port to be level with the black plastic before soldering. Use a max. 40W solder and soldering tin with a tin and lead ratio of 60/40 together with a joint solution inside. Recheck the assembled circuit for your own confidence. Better use a lead sucker or a lead wire absorber in case of component misplacing to protect PCB from damage.

The Body set is to be assembled as shown in the next page.
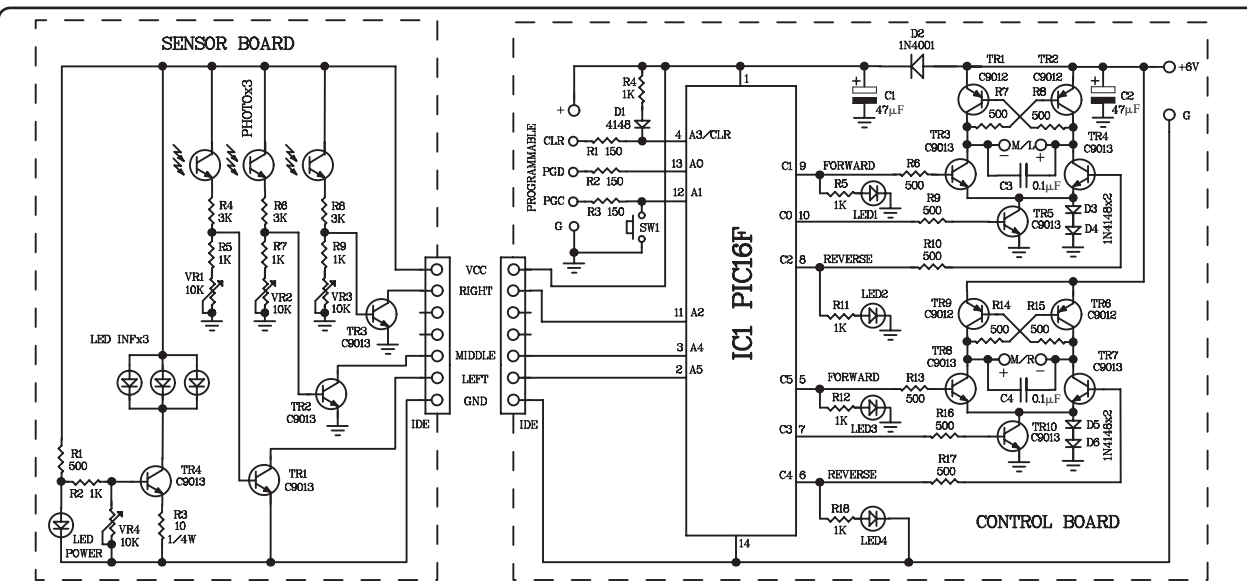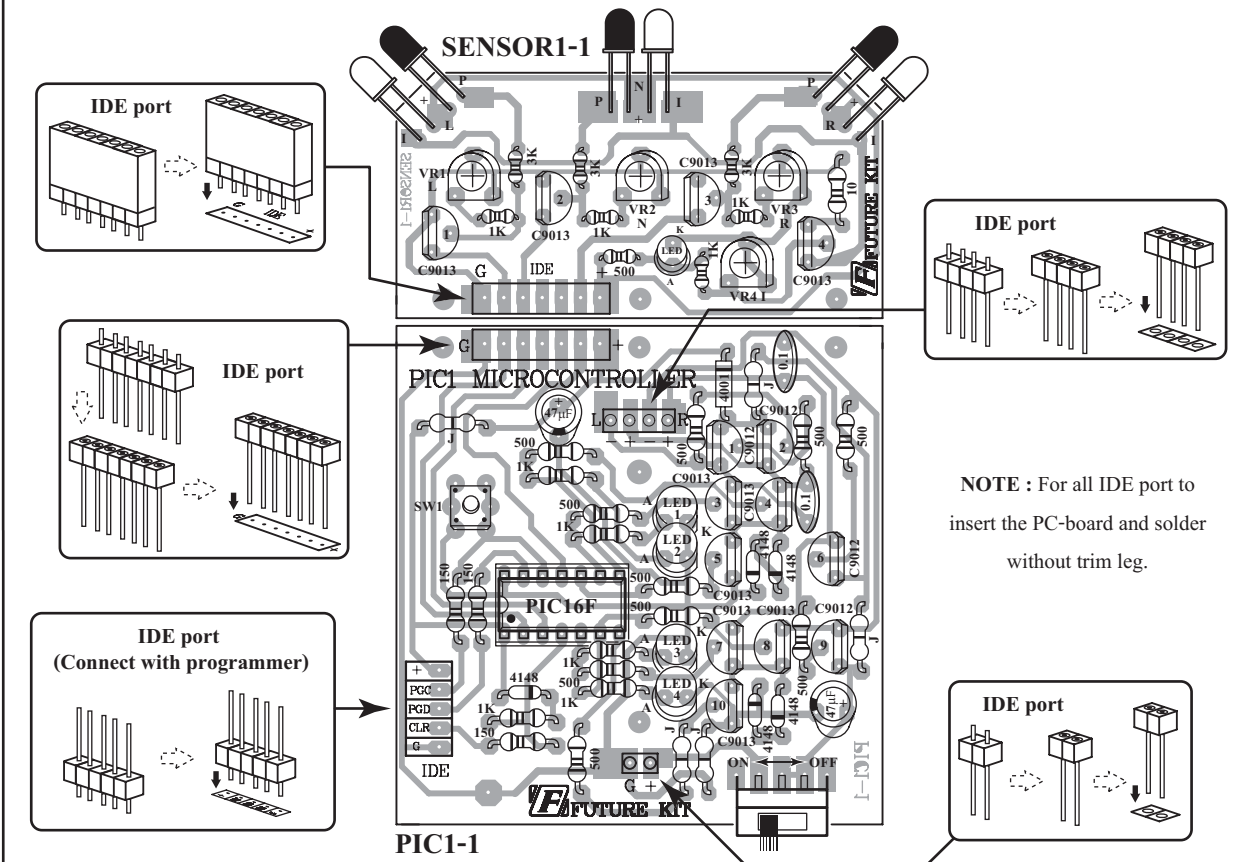
Testing:

When the two circuit boards have been completely assembled, insert four AA batteries into the battery holder. Then adjust all trimpot to the middle side and slide switch SW to "on" position. LED at sensor board is lighted on. Lay down the assembled robot on the box. When any sensor detects bar, The robot will avoid the bar and running the other way.

VR1, VR2 and VR3 will act as sensitivity of photo-transistor. Adjust to the left hand side for decreasing sensitivity and to the right hand side for increasing sensitivity. VR4 will act as level of infrared light. SW1 is not used.

Troubleshooting:

As the circuit has only a few components, the main cause of troubles will come from component misplacing and defaulted soldering. When found out that the circuit does not work, check for the proper component placings and various soldering points.

Figure 1. PIC1 Obstacle-Avoiding Robot Circuit

Figure 2. PIC1-1 and SENSOR1-1 Circuit Board Assembling

NOTE : For all IDE port to insert the PC-board and solder without trim leg.

SENSOR BOARD
RESISTOR 1/8W

R1	500Ω	- green-black-brown-gold
R2,R5,R7,R9	1kΩ	- brown-black-red-gold
R4,R6,R8	3kΩ	- orange-black-red-gold

RESISTOR 1/4W

R3	10Ω	- brown-black-black-gold

TRIMMER POTENTIOMETERS

VR1-VR4	=	10kΩ or 103

TRANSISTORS

TR1-TR4	=	C9013

CONTROL BOARD
RESISTOR 1/4W

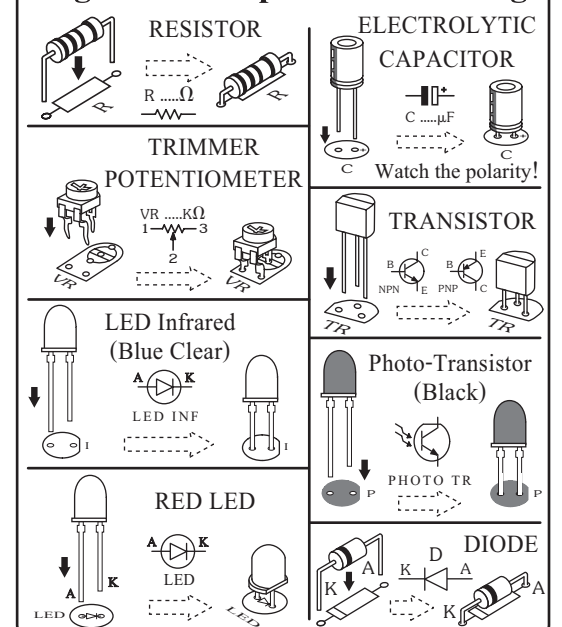|		
R1-R3	150Ω	- brown-green-brown-gold
R4,R5,R11,R12,R18	1kΩ	- brown-black-red-gold
R3	50Ω	- green-black-black-gold
R6-R10,R13-R17	500Ω	- green-black-brown-gold

TRANSISTORS

TR1,TR2,R6,R9	=	C9012
TR3-TR5,R7,R8,R10	=	C9013

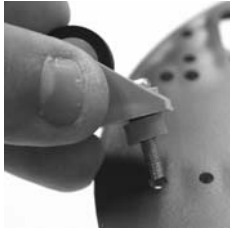**DIODES**

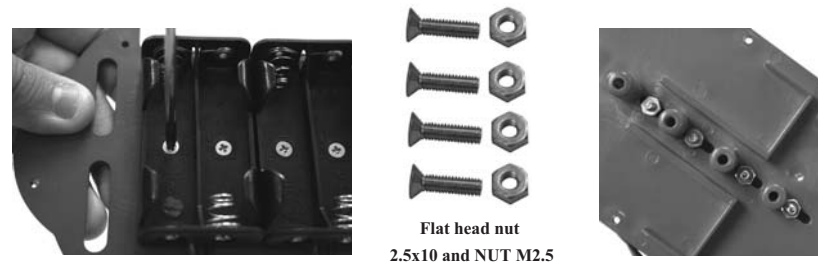|		
D1	=	1N4148
D2	=	1N4001

Figure 3. Components Installing

(2) ROBOT BODY

Assembling Steps of the Body set.

① Fix a mini caster wheel set to the Body set with using a 12 mm. bolt as a holder.

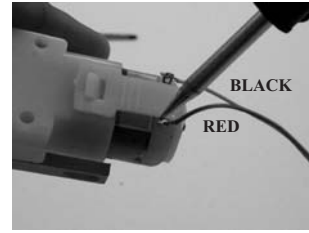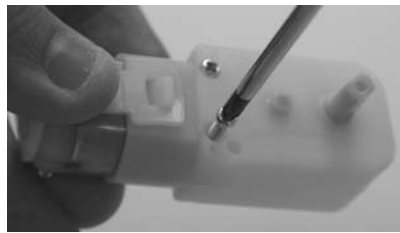**Mini Caster**

② Install battery holder to body robot with flat head nut 2.5x10 and nut M2.5.

Flat head nut 2.5x10 and NUT M2.5
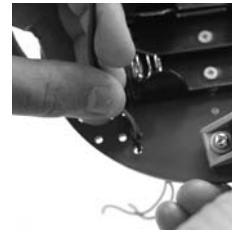
③ Insert the electric wire battery holder into body robot.

④ Take off the both screw of motor gear and then mount the motor lock. Secure with the both screw of motor gear.

BLACK
RED

Solder electric wire at motor pole with red wire solders at left hand side and black wire solders at right hand side.
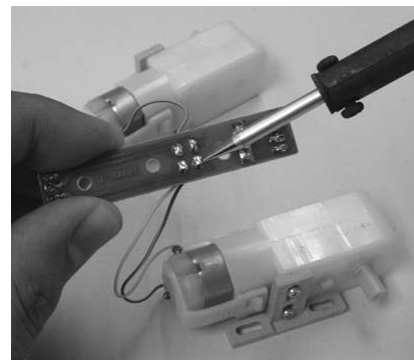
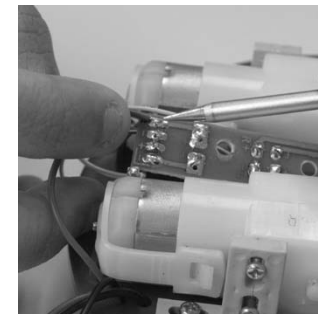**⑤** Solder motor wire to BR002-1 PC-board. Red wire is positive pole and black wire is negative pole. Character "L" is left motor gear and "R" is right motor gear.
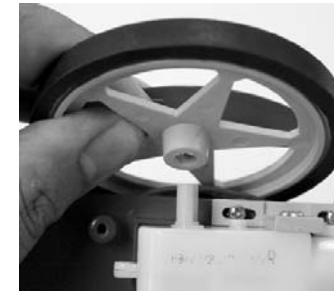
Screw 4x1/4

⑥ Mount motors, each with two #4 x 1/4" screws

⑦ Solder battery holder wire to BR002-1 PC-board at B1 and B2. Red wire is positive pole and Black is negative pole.
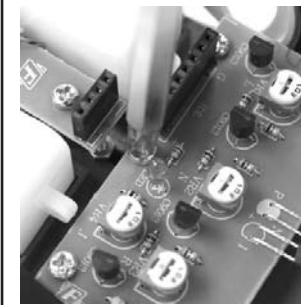
Screw 2x1/4

⑧ Mount BR002-1 PC-board into body robot and secure them with two #2 x 1/4" screws.

⑨ Install the wheels onto the shaft of the gear motors and secure them with the remaining two #4 x 1/4" pointy screws.
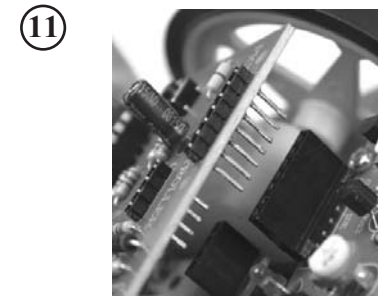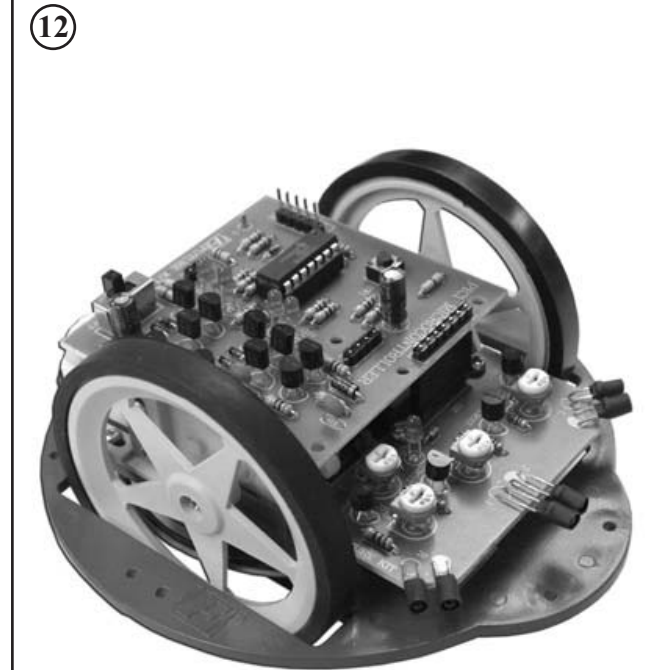
Screw 4x1/4

⑩ Mount sensor board into body robot and secure with two #2 x 1/4" screws.

Screw 2x1/4

⑪ Install the control board into body robot.

⑫

The robot is prompt working and playing.