

KSR4 – "ESCAPE" ROBOT KIT

1. Introduction & Characteristics



Thank you for buying the **KSR4**! Read this manual carefully before bringing the device into use.

The **KSR4** works just like an A.I. robot. It never fails to find its way out of a maze. The Escape Robot uses 3 infrared emitting diodes and 1 infrared receiving module to send and receive signals and detect obstacles. The Escape Robot's built-in microprocessor enables it to "think" on its own: it gathers and processes information about its environment, which enables it to avoid any obstacle. The Escape Robot moves around on 6 legs.

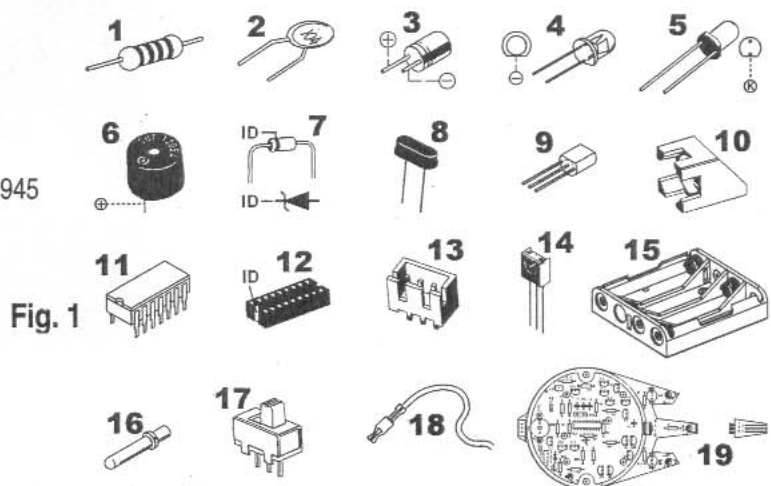
The Kit comes complete with 2 sets of differently designed legs, which move in their own distinct way. Fun and excitement are guaranteed.

The **KSR4** requires four 1.5Vdc AAA-batteries (not included).

Apart from the batteries, you will also need a pair of long-nose pliers, a soldering iron, a diagonal cutter, a screwdriver, a soldering iron and a length of solder wire.

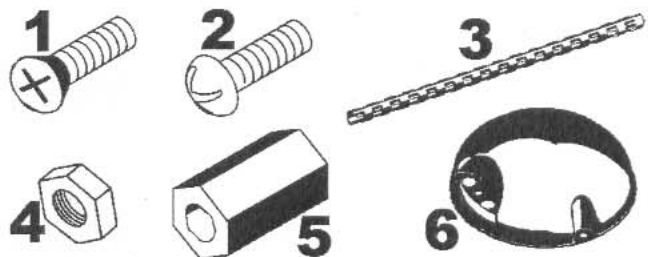
2. Electronic Parts List

1. resistor: 4x 10 Ω (brown/black/black/gold)
2x 16 Ω (brown/blue/black/gold)
1x 39 Ω (orange/white/black/gold)
1x 100 Ω (brown/black/brown/gold)
5x 1K (brown/black/red/gold)
1x 10K (brown/black/orange/gold)
4x 22K (red/red/orange/gold)
2. ceramic capacitor: 2x type 30, 1x type 103, 3x type 104, 1x type 224
3. electrolytic capacitor 100uf (1x)
4. IR LED 5mm, clear (3x)
5. LED 5mm, red (1x)
6. buzzer (1x)
7. Zener diode 3.9V (1x)
8. oscillator 4MHz (1x)
9. transistor: 7x 8050, 4x 8550, 1x 9013, 4x C945
10. LED holder (3x)
11. IC: 1 x type 78P156 (1602BP)
12. IC socket (1x)
13. Battery connector (1x)
14. IR receiving module (1x)
15. battery holder (1x)
16. pin (4x)
17. slide switch (1 x)
18. connector with wire: 1 x yellow, 1 x green,
1 x orange, 1 x blue
19. PCB (1 x)



3. Mechanical Parts List

1. 2x screw P13 (3x6mm)
2. 4x screw P14 (3x6mm)
3. 2x hosepipe P18
4. 2x nut P16 (M3)
5. 2x hex post P15 (10mm)
6. 1x body P17



4. Assembly

a) PCB Assembly

Start the assembly by mounting the resistors. The names of all components have been printed on the PCB:

Part ID	Description	Colour Code	Quantity
R18	100Ω	brown/black/brown/gold	1
R11/12/13/14	10Ω	brown/black/black/gold	4
R3/4	16Ω	brown/blue/black/gold	2
R1	39Ω	orange/white/black/gold	1
R5/7/8/9/10	1K	brown/black/red/gold	5
R15	10K	brown/black/orange/gold	1
R2/6/16/17	22K	red/red/orange/gold	4

Mount the zener diode, the capacitors, the transistors and the oscillator next:

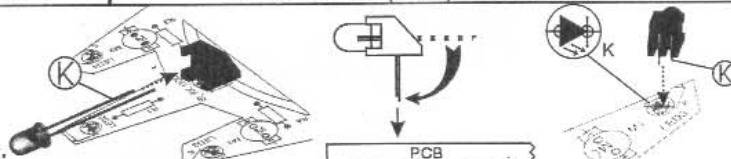
Part ID	Description	Quant.
ZD1	Zener diode 3.9V	1
C2/3	ceramic capacitor 30	2
C1	ceramic capacitor 103	1
C4	ceramic capacitor 104	1
C5	ceramic capacitor 224	1
EC1	electrolytic capacitor 100uf	1
Q5/6/7/8	transistor 8550	4
Q2	transistor 9013	1
Q1/3/4/9/10/11/12	transistor 8050	7
Q13/14/15/16	transistor C945	4
XTAL	oscillator 4MHz	1

Mount the IC socket, the battery connector, the slide switch, the buzzer and the pins.

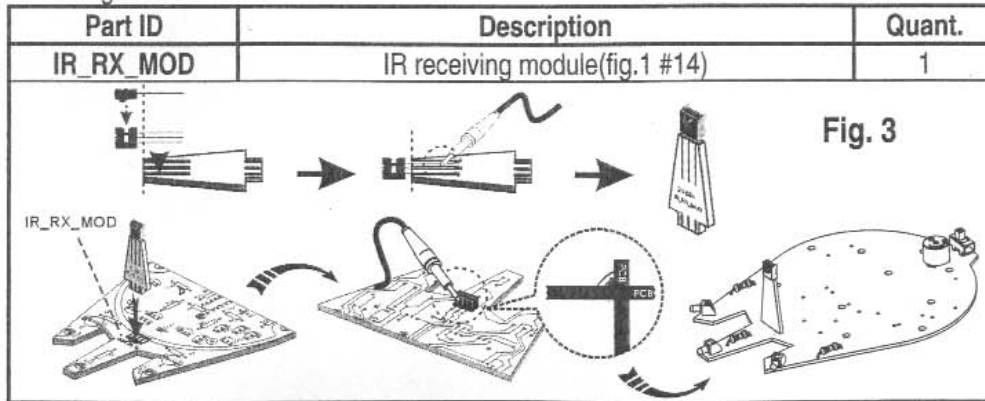
Part ID	Description	Quant.
IC1	IC socket (fig.1 #12)	1
BAT.	battery connector (fig.1 #13)	1
SW.	slide switch (fig.1 #17)	1
BZ1	buzzer (fig.1 #6)	1
M1 (+/-)	pins (fig.1 #16)	4
M2 (+/-)		

Mount the LED, the IR LEDs and the IC:

Fig. 3

Part ID	Description	Quantity
LED1	LED 5mm (red)	1
LED2/3/4	IR LED 5mm (clear) + LED holder	3 + 3
		
IC1	78P156 ID (1602BP) IC Socket ID	1

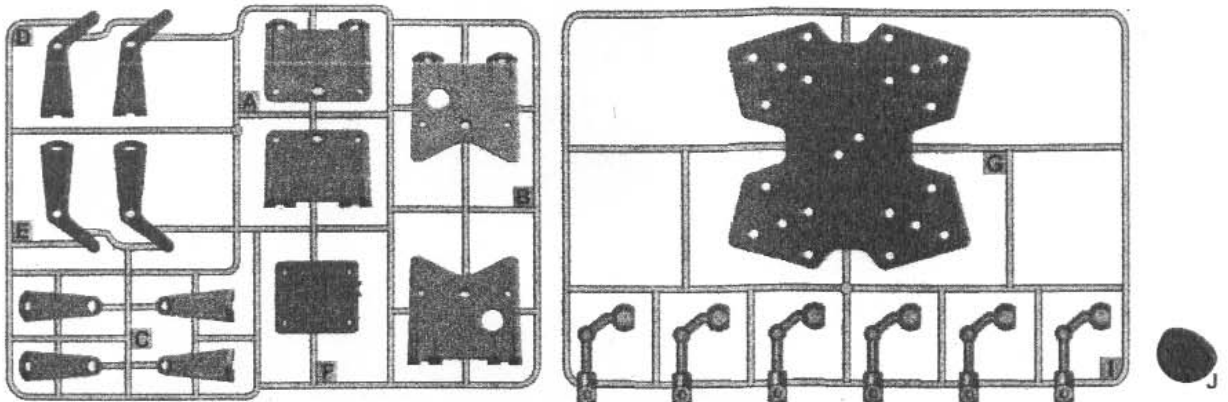
Mount the IR receiving module:



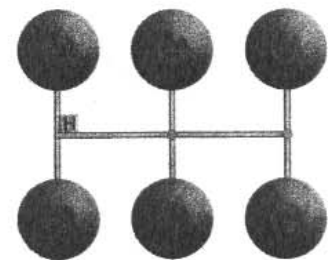
b) Gearbox Assembly

Parts

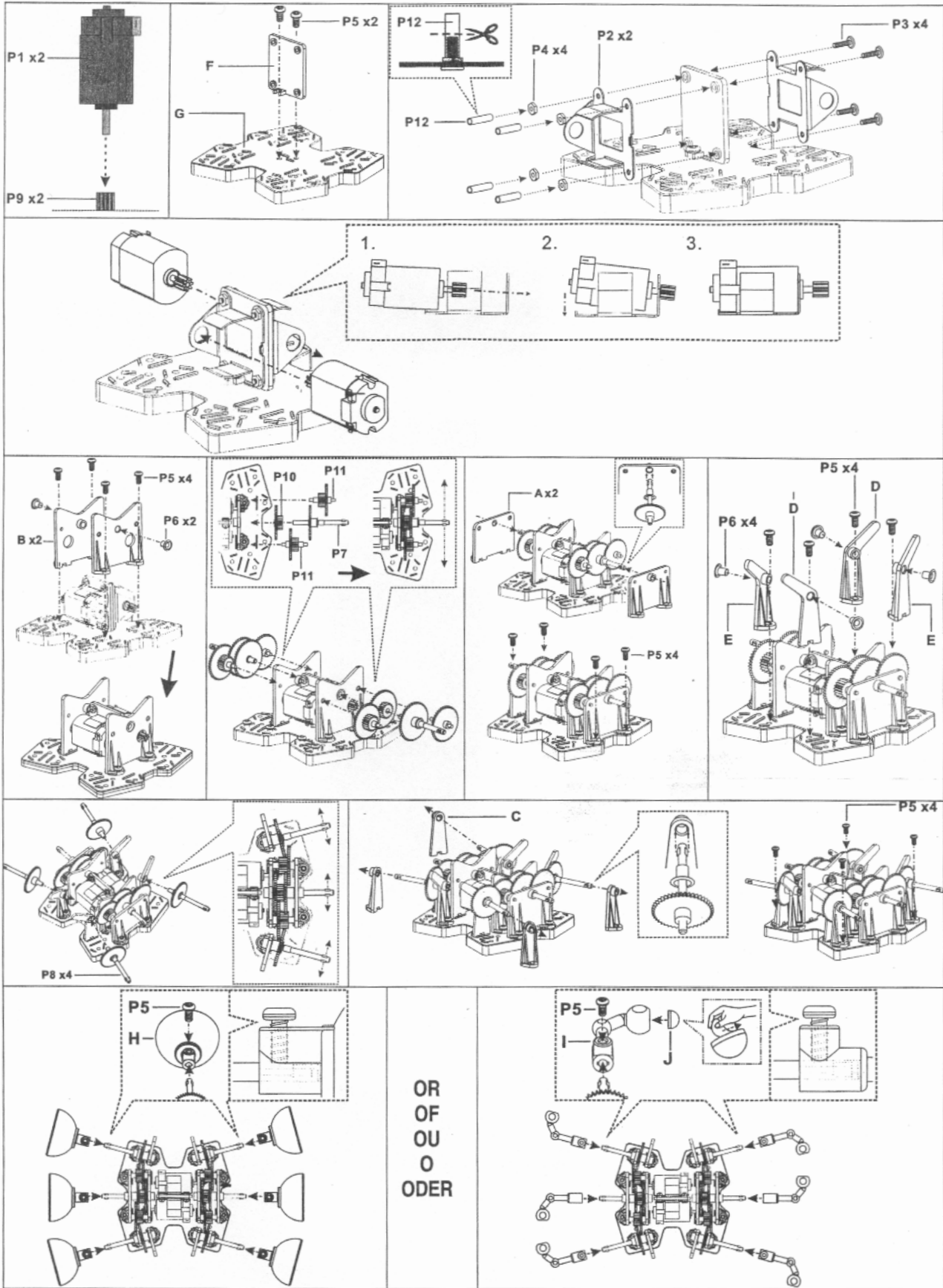
- P1: motor x 2
- P2: motor holder x 2
- P3: screw (2x10mm) x 4
- P4: nut (M2) x 4
- P5: tapping screw (3x7mm) x 34
- P6: eyelet x 6
- P7: gear (44T+0) with shaft (green) x 2
- P8: gear (44T+0) with shaft (orange) x 4
- P9: pinion gear 8T (white) x 2
- P10: gear 48/18T (white) x 2
- P11: gear 44/18T (blue) x 4
- P12: clear tube x 2



- A: gear protection plates (2)
- B: motor protection plates (2)
- C: protection plates (4) for corner wheel/leg gears
- D: gear brackets (2) for corner wheel/leg gears
- E: gear brackets (2) for corner wheel/leg gears
- F: motor mounting bracket (1)
- G: top plate (1)
- H: wheels (6)
- I: legs (6)
- J: rubber feet for legs (6)

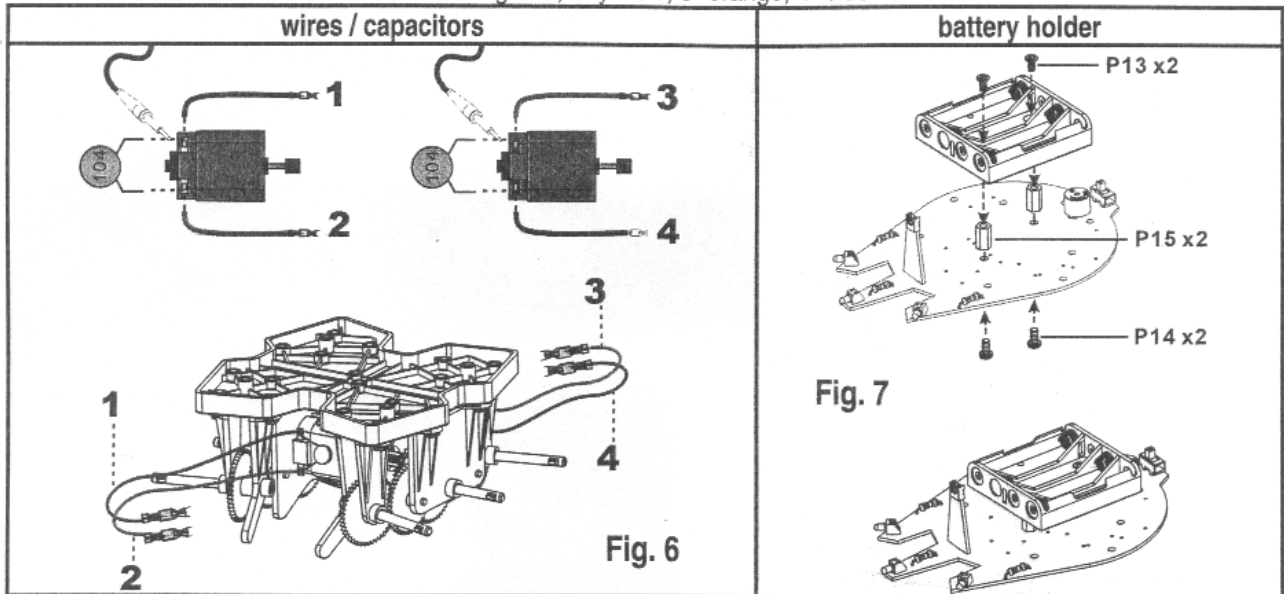


Assembly

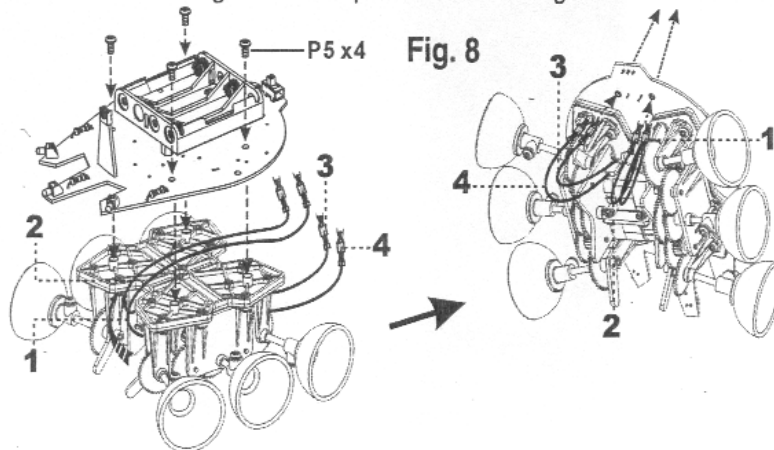


c) Mechanical Assembly

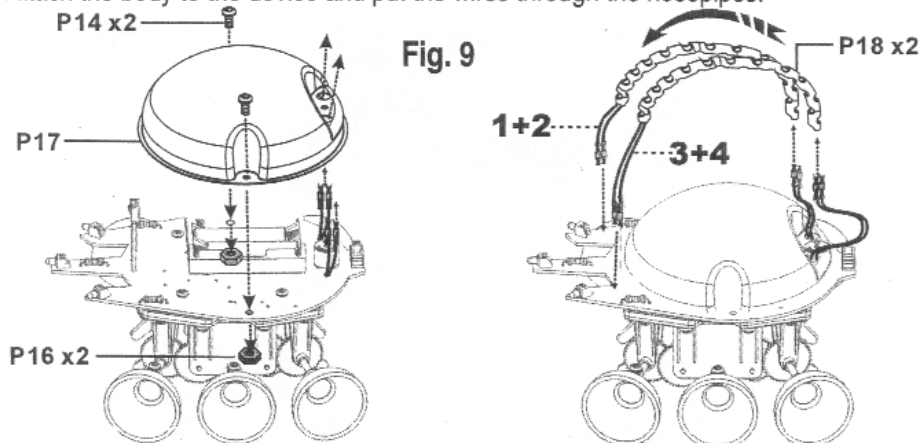
1. Mount the wires and the ceramic capacitors type 104 on the motors and fix the battery holder on the PCB. Connect the battery holder to the battery connector (BAT, see "4.a) PCB assembly"). The colour code used for the wires is: 1=green, 2=yellow, 3=orange, 4=blue



2. Fix the PCB to the gearbox and put the wires through the holes at the back of the device.

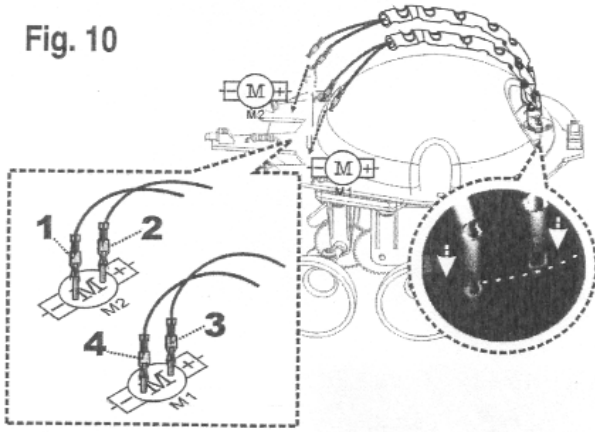


3. Attach the body to the device and put the wires through the hosepipes:



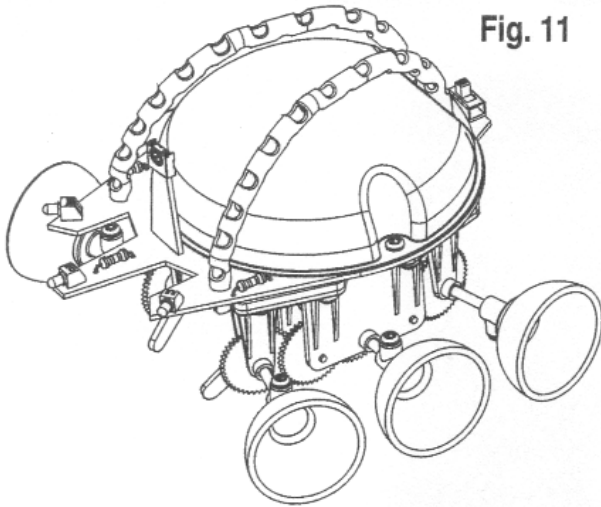
4. Connect the wires to the pins on the M-terminals.

Fig. 10



5. Finished product

Fig. 11



5. Wiring Diagram

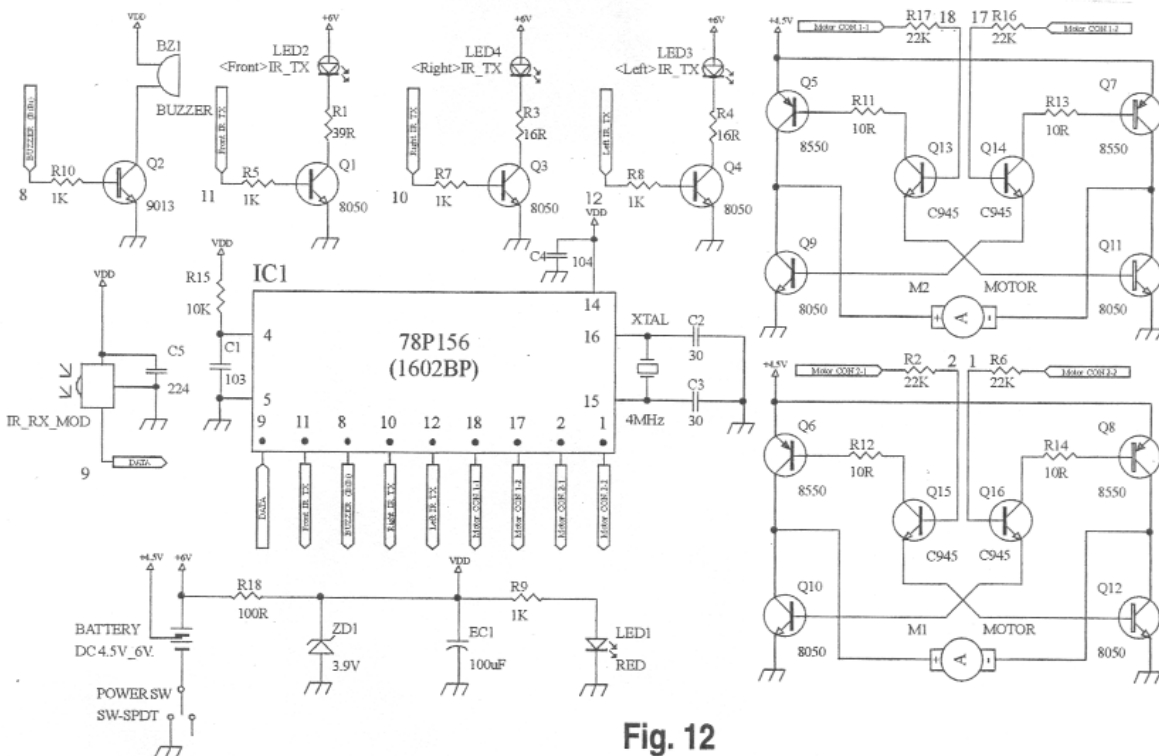


Fig. 12

6. Operation

Put the switch in the "ON"-position. LED1 is lit, the device emits 3 beeps and the **KSR4** starts walking. The emitting diodes LED2, LED3 and LED4 send signals in sequence in order to detect obstacles. When an obstacle is detected, the received signal is sent to the receiving module which will then instruct the robot to take evasive action:

- a) When the emitting diode to the right detects an obstacle, you will hear a single beep. The left motor goes into reverse mode.
- b) When the emitting diode to the left detects an obstacle, you will hear a single beep. The right motor goes into reverse mode.
- c) When the emitting diode in the middle detects an obstacle, you will hear two beeps. The two motors go into reverse mode. Subsequently, the procedure explained in a) is followed.
- d) When all three emitting diodes detect obstacles, you will hear three beeps. The device then follows the procedure described above in c), but turning takes somewhat longer.

7. Troubleshooting

1. Make sure all components on the PCB are in the right position. Pay particular attention to the polarity of the IR diode.
2. The sensitivity may be affected by fading battery power and a change in environment. Try to find the ideal position for the IR receiving module.
3. Apply a little bit of machine oil to the axles of the gears if the **KSR4** isn't running smoothly.

Note: The specifications and contents of this manual can be subject to change without prior notice.