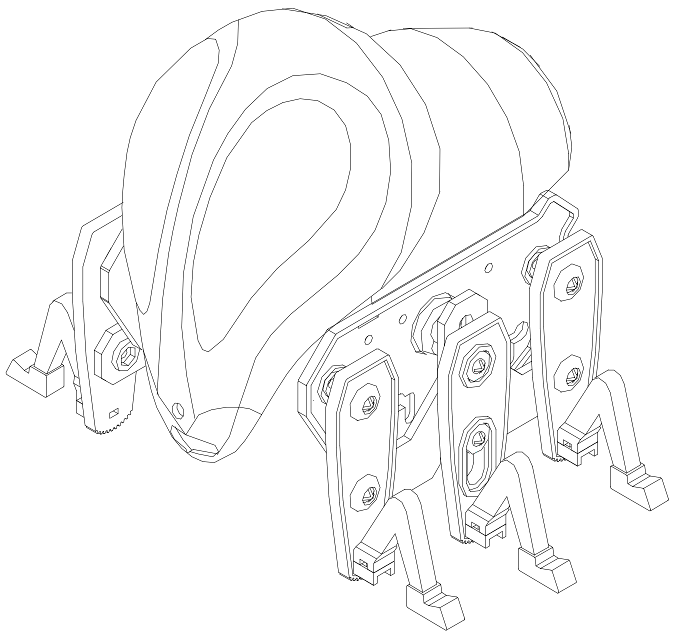
A division of Instruments Direct Limited

Antoid



Model: MR-1002

Manufactured by Instruments Direct Limited

READ BEFORE PROCEEDING

Read this manual carefully before getting started on your robot. Ask someone to help you read the instructions. Keep this manual for future reference.

- Take care when using sharp tools such as, knives or screwdrivers.
- Keep the robotic parts away from small children. Do not assemble the robot where small children can reach it.
- Keep fingers out of the working parts such as the motors and gears.
- Do not force the robot to move/stop; this could cause the motors to overheat.
- The Specification and anything contained within this manual are subject to change without notice.
- When using batteries:

  -Use the batteries in the correct polarity (+ -)

  -Never short circuit, disassemble, heat, or dispose of batteries in a fire.

  -When the robot is not in use the batteries should be removed.

  -If the batteries or robot become wet, remove the batteries from the hold and dry the robot.

  -Do not mix old and new batteries. Do not mix alkaline, standard (carbon-zinc) or rechargeable (nickel-cadmium) batteries. We recommend the use of alkaline batteries for extended life.

Product Information

Antoid
Model: MR-1002

About
Antoid walks forward with its six insect like legs and will avoid objects in its way. It can detect objects with its infrared eye and move accordingly.

Specification

Power source	Electronic circuit:	7mA
	Mechanical section:	230mA
Power voltage	Electronic circuit:	DC 9V
	Mechanical section:	DC 3V
Power consumption	Electronic circuit:	Approx. 7mA
	Mechanical section:	Approx. 230mA
Maximum detectable range		Approx. 50cm

Height	155mm
Length	150mm
Width	180mm

History of Robots

A brief review of robot development is important as it puts the current machines and interest in them into an historical perspective. The following list highlights the growth of automated machines that led to the development of the industrial robots currently available today.

1801
Joseph Jacquard invents a textile machine that is operated by punch cards. The machine is called a programmable loom and goes into mass production.

1830
American Christopher Spencer designs a cam-operated lathe.

1892
In the United States, Seward Babbitt designs a motorised crane with gripper to remove ingots from a furnace.

1921
The first reference to the word robot appears in a play opening in London. The play, written by Czechoslovakian Karel Capek, introduces the word robot from the Czech robota, which means a serf or one in subservient labour. From this beginning the concept of a robot takes hold.

1938
Americans Willard Pollard and Harold Roselund design a programmable paint-spraying mechanism for the DeVilbiss Company.

1948
Norbert Wiener, a professor at M.I.T., publishes Cybernetics, a book that describes the concept of communications and control in electronic, mechanical, and biological systems.

1954
The first programmable robot is designed by George Devol, who coins the term Universal Automation. He later shortens this to Unimation, which becomes the name of the first robot company.

1959
Planet Corporation markets the first commercially available robot.

1960
Unimation is purchased by Condec Corporation and development of Unimate Robot Systems begins. American Machine and Foundry, later known as AMF Corporation, markets a robot,

1962
General Motors installs the first industrial robot on a production line. The robot selected is a Unimate.

1968
SRI builds and tests a mobile robot with vision capability, called Shakey.

1970
At Stanford University a robot arm is developed which becomes a standard for research projects. The arm is electrically powered and becomes known as the Stanford Arm.

1973
The first commercially available minicomputer-controlled industrial robot is developed by Richard Hohn for Cincinnati Milacron Corporation. The robot is called the T3, “The Tomorrow Tool”.

1974
Professor Scheinman, the developer of the Stanford Arm, forms Vicarm Inc. to market a version of the arm for industrial applications. The new arm is controlled by a minicomputer.

1976
Robot arms are used on Viking 1 and 2 space probes Vicarm Inc. incorporates a microcomputer into the Vicarm design.

1977
ASEA, a European robot company, offers two sizes of electric powered industrial robots. Both robots use a microcomputer controller for programming and operation. In the same year Unimation purchases Vicarm Inc.

1978
The Puma (Programmable Universal Machine for Assembly) robot is developed by Unimation from Vicarm techniques and with support from General Motors.

1980
The robot industry starts its rapid growth, with a new robot or company entering the market every month.

A brief overview
When, in 1954 George C. Devol filed a U.S. patent for a programmable method for transferring articles between different parts of a factory, he wrote:
"The present invention makes available for the first time a more or less general purpose machine that has universal application to a vast diversity of applications where cyclic control is desired."

In 1956 Devol met Joseph F. Engelberger, a young engineer in the aerospace industry. With others, they set up the world's first robot company, Unimation, Inc., and built their first machine in 1958. Their initiative was a great deal ahead of its time; according to Engelberger, Unimation did not show a profit until 1975.

The first industrial robot saw service in 1962 in a car factory run by General Motors in Trenton, New Jersey. The robot lifted hot pieces of metal from a die-casting machine and stacked them.

Japan, by comparison, imported its first industrial robot from AMF in 1967, at which time the United States was a good 10 years ahead in robotics technology.
By 1990, there were more than 40 Japanese companies that were producing commercial robots. By comparison, there were approximately one dozen U.S. firms, led by Cincinnati Milacron and Westinghouse's Unimation.

The Future of Robots
Robots and the robotics industry will continue to grow at a rapid rate. As technology advances so will the robots that rely so heavily upon these advances. Robots will become more technical until one day they will become as powerful as we are.

Assembly of Parts

Tools needed for assembly

+ Screwdriver (M3) 	Long-nose pliers  Used to handle small parts	Cutting pliers  For cutting plastic parts
Small mallet/hammer  Used for installing pinion gears		Power supply  AA Battery x 2pcs 9V Battery x 1pc

Helpful Hints prior to assembly

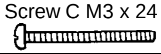
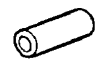
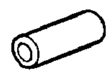
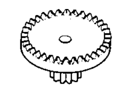
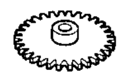
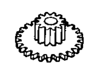
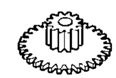
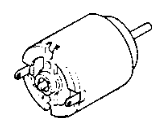
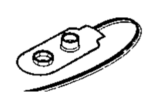
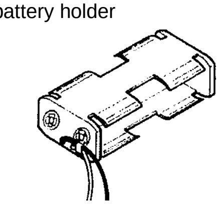
Removing parts from plastic frame
Use the cutting pliers to remove the individual parts from the plastic frame, remove any burrs or flashing left on the parts.

Tapping screws
Tapping screws make threads like screws do in wood. The best way to screw a tapping screw is to screw in a couple of turns and then unscrew half a turn, repeat this until the screw is in flush to the surface.

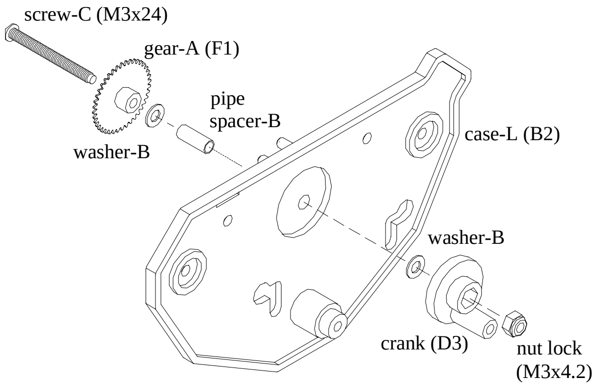
Tightening of nuts and screws
Make sure nuts are tightened securely to the bolts; if not they may work loose and cause the robot to malfunction. Also make sure the nuts are not too tight and cause the parts to function incorrectly.

Screw sizing
The size of the screws is expressed by the thickness and length. A screw marked M3 x 10, is 3mm thick and 10mm long. Nuts are measured in a similar way corresponding to the size of the screw. A M3 nut is used on an M3 bolt/screw.

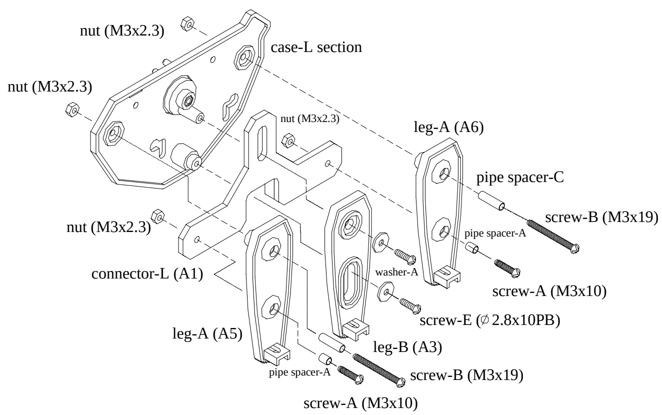
Parts List

Screws Screw A M3 x 10 14pcs  Screw B M3 x 19 4pcs  Screw C M3 x 24 2pcs 	Tapping Screws Screw D 2.6 x 6 4pcs  Screw E 2.6 x 10 5pcs 	Washer  4pcs  4pcs
Pipe spacer A  4pcs Pipe spacer B  4pcs Pipe spacer C  4pcs	Nut M3 x 2.3  2pcs Pinion Gear  2pc	Lock Nut M3 x 4.2  2pcs Crown Gear (34)  2pc
Flat spur gear with boss Gear A (40)  2pcs	Flat spur gear with pinion Gear B-small (24-12)  2pc	Flat spur gear with pinion Gear C-large (32-12)  2pc
3v Motor  2pc	9Volt battery snap  1pc	AA battery holder  1pc

1. Assembly of left case

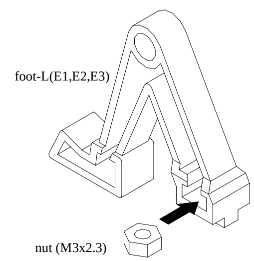


2. Assembly of left section and legs

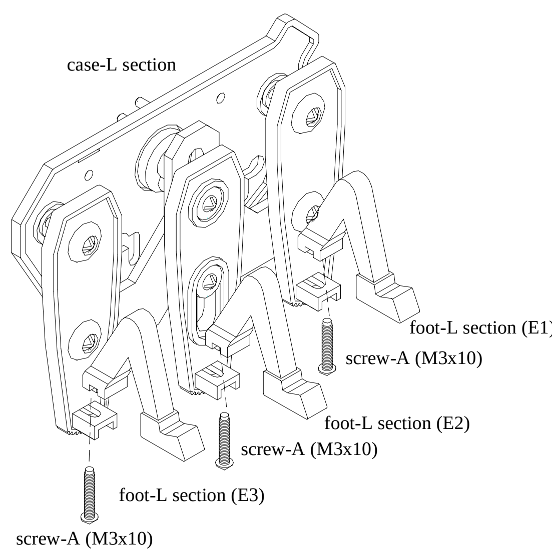


3. Assembly of left foot section, complete for each of the 3 left feet

Assembling foot-L section

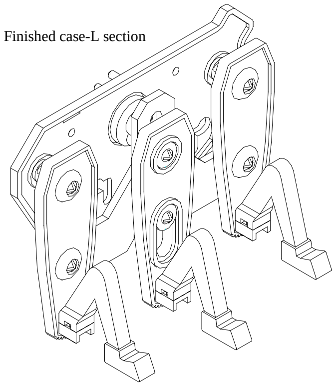


4. Assembly of left case section

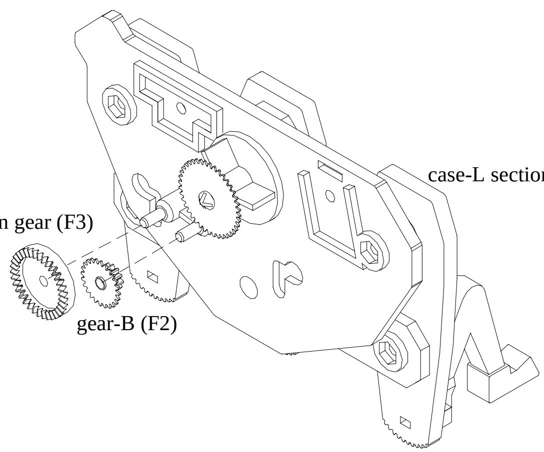


Continuation of step 4

Finished case-L section

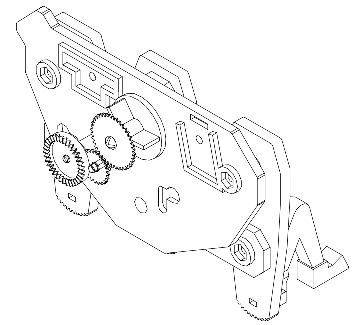


5. Attaching the gears to the left section

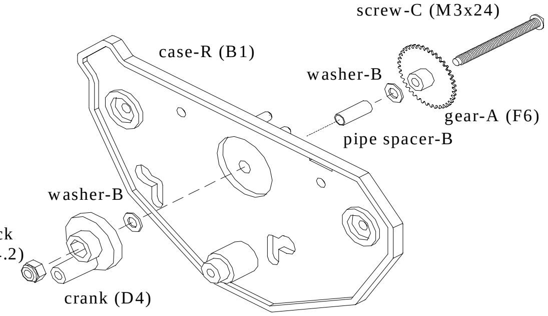


Continuation of step 5

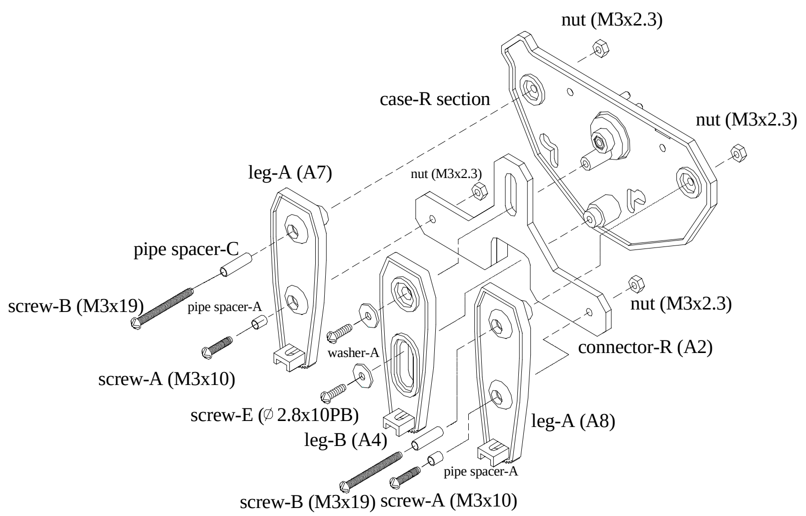
Finished left case and gears section



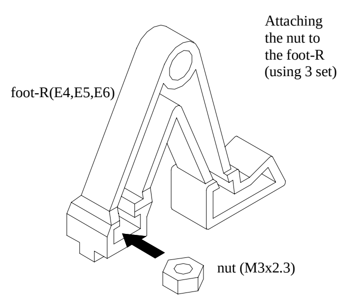
6. Assembling right case and gear-A



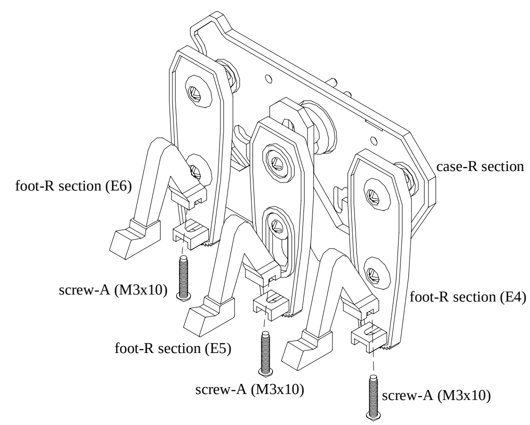
7. Assembling right case section and legs



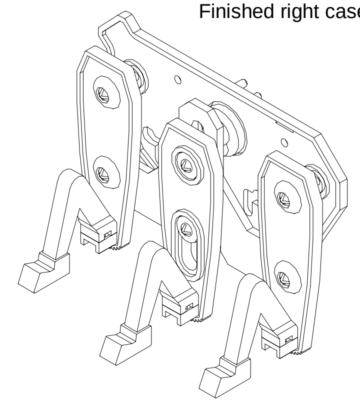
8. Assembly of right foot section, complete for each of the 3 right feet



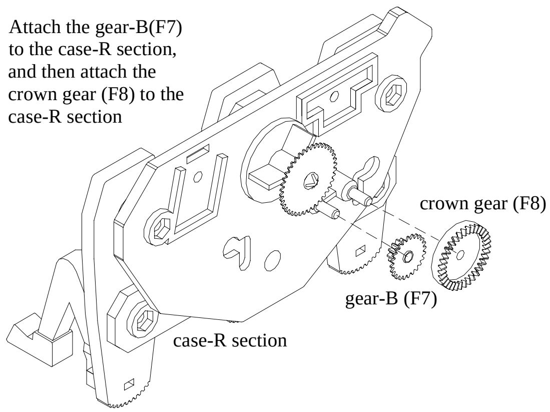
9. Assembling right case section



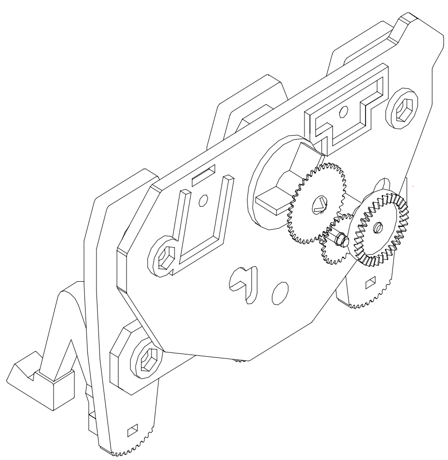
Finished right case section



10. Attaching gears to right section

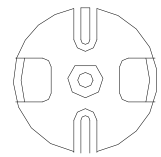


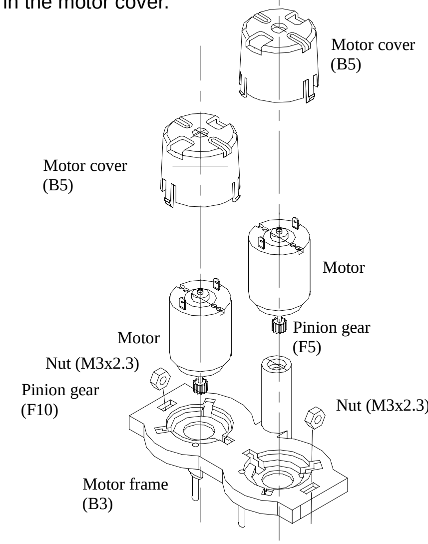
Finished right case and gears section



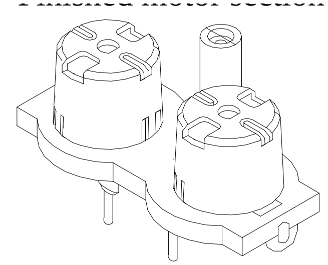
11. Assembly of motor section

When installing the motor cover over the motor make sure the motor terminals match the holes in the motor cover.

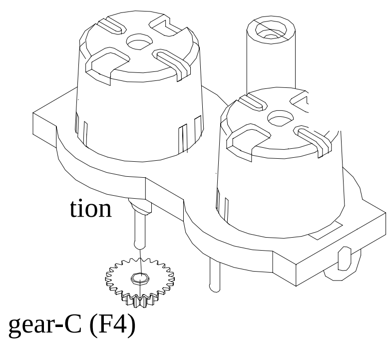




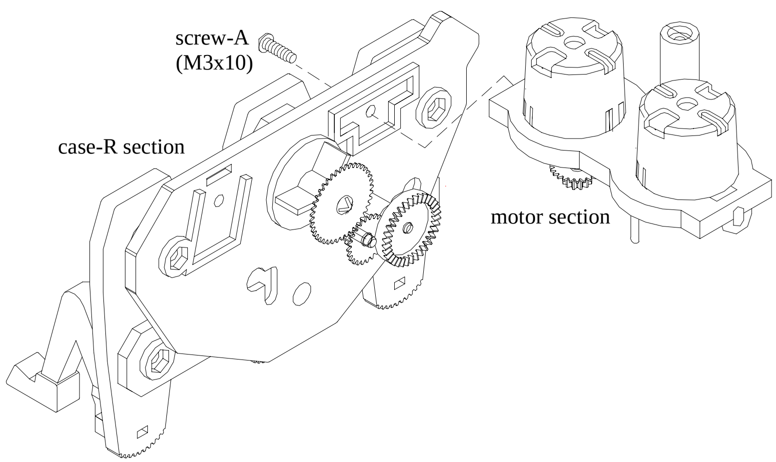
Finished motor section



12. Attaching motor section and gear-C

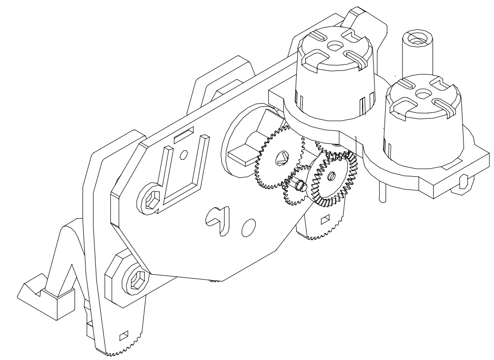


13. Assembling right case section and motor section

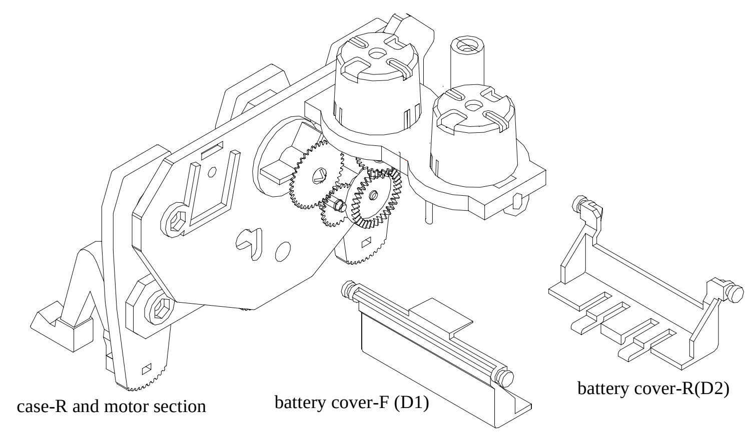


Continuation of step 13

Finished assembly of right case section and motor section

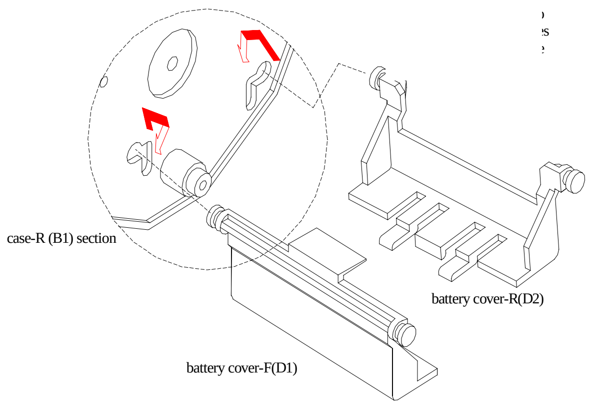


14. Assembling of right case, motor section and battery covers

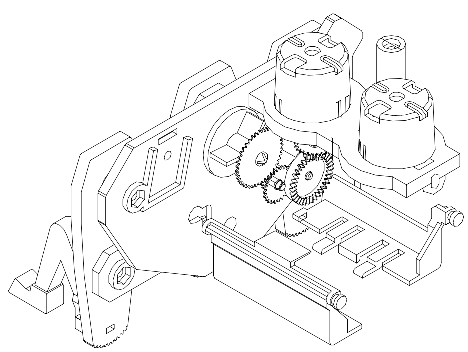


Continuation of step 14

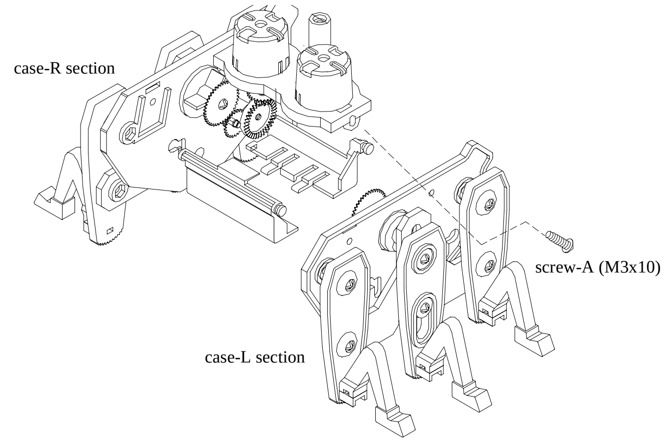
Note: Install the battery covers as shown



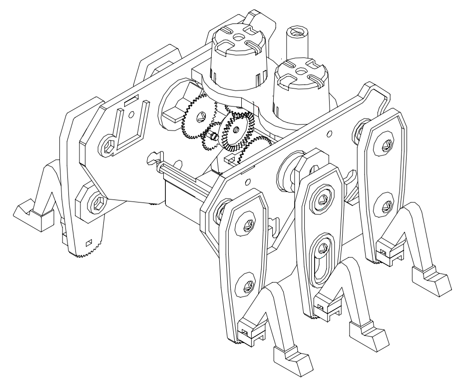
Finished right case, battery covers and motor section



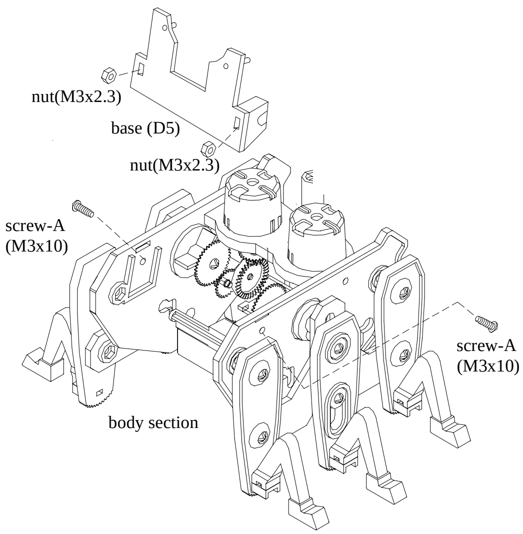
15. Attaching left and right cases



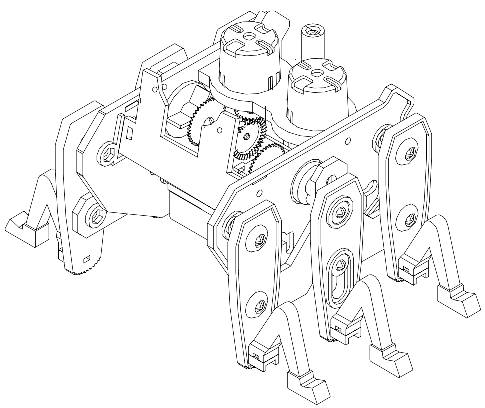
Left and right cases attached



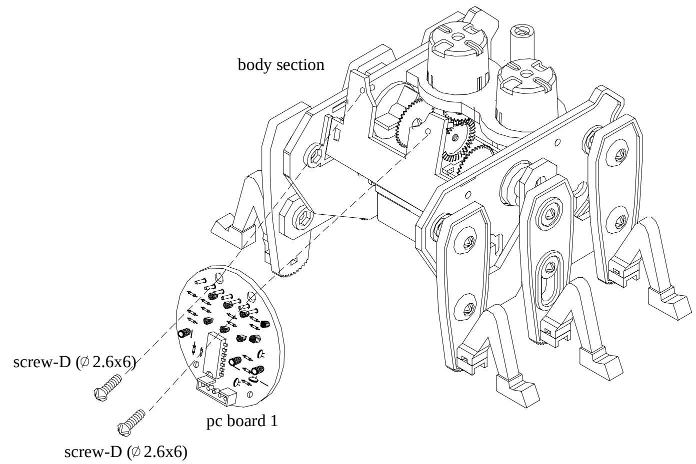
16. Attaching the base to the body section



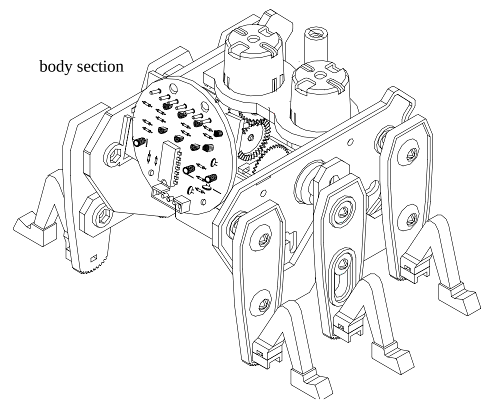
Finished body section



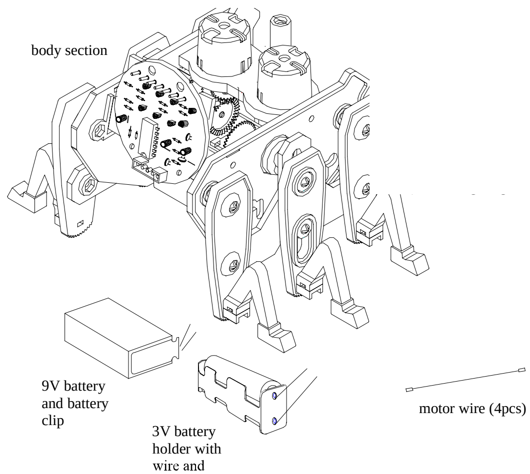
17. Attaching the PC board



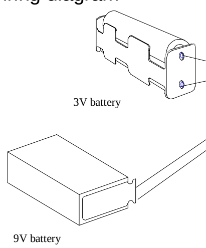
PC board attached

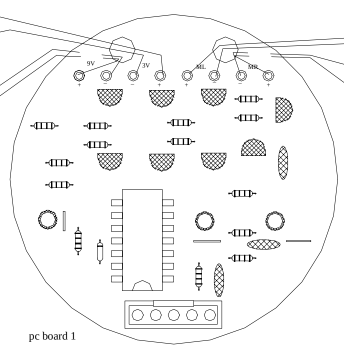


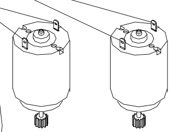
18. Attaching the batteries and the motor wires



Wiring diagram

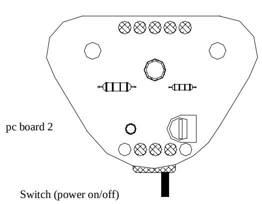






Right

Wire	Marking on PCB
9V Battery holder, Red	9V +
9V Battery holder, Black	9V -
3V Battery holder, Red	3V +
3V Battery holder, Black	3V -



Right motor:

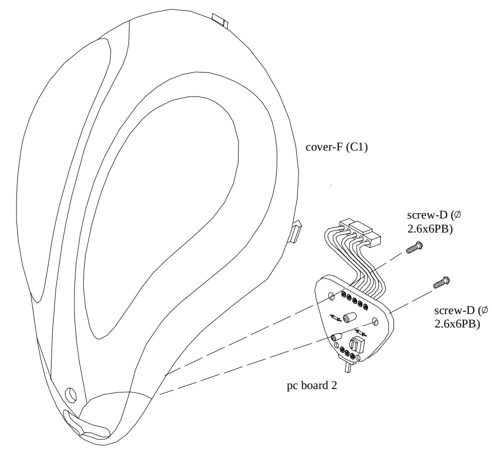
Connect the yellow motor wire to the MR+

Connect the green motor wire to the MR-

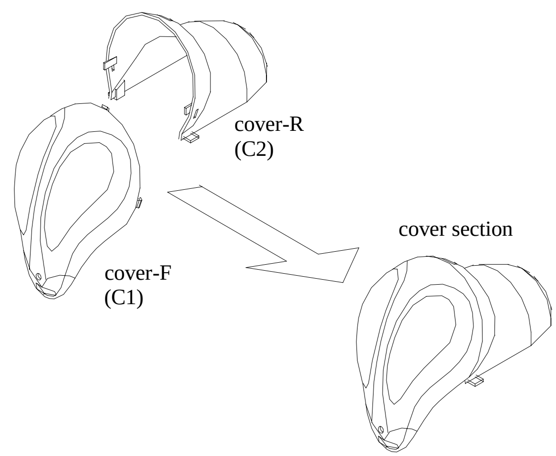
Left motor:

Connect the yellow motor wire to the ML+
Connect the green motor wire to the ML-

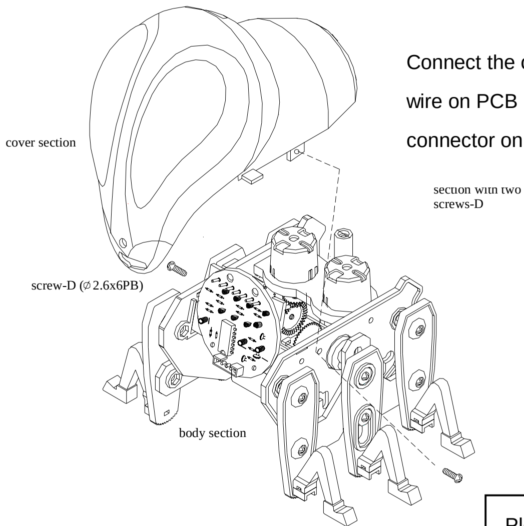
19. Attaching PC board 2



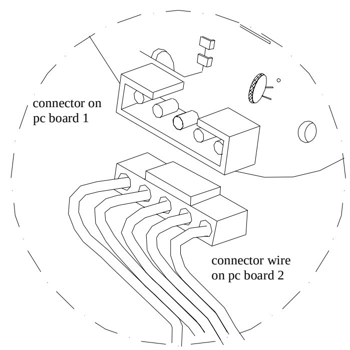
20. Attaching cover F and R to make the cover section



21. Attaching the cover section to the main body, wiring in the head section

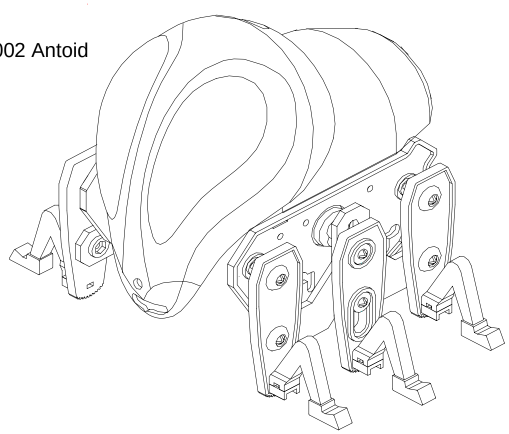


Connect the connector wire on PCB 2 to the connector on PCB 1.



Please note: Be sure to grease the gears to ensure smooth running of your Antoid.

Completed MR-1002 Antoid



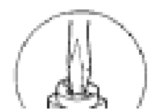
The Antoid will walk forward until it meets an obstacle, at which point it will reverse. It will do this by moving just one set of its legs while the other stays stationary. When the Antoid is free from the obstacle it will continue to walk normally.

How to operate the Antoid

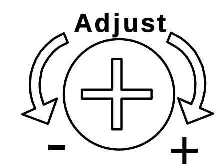
1. Install both the “AA” batteries, to the holder and connect the “9V” battery to the 9V battery snap.
2. Close the battery case making sure that the two pieces snap together.
3. Place the Robot in a clear space with no obstacles ahead.
4. Switch on the power, the LED will turn on.
5. Move an obstacle into the Antoid’s path, the robot will retreat away from the object.
6. Remove the obstacle, the robot will move forward.

If the robot does not function correctly, firstly adjust the sensitivity:

The range of the detectable sensor can be easily adjusted using a small screwdriver to adjust the variable resistor.



Care should be taken not to over tighten the variable resistor.



Problem	Solution
The LED does not light up when the robot is switched on	Check the wiring of the LED Check the polarity of the 9V battery
The motors do not move when the robot is switched on	Check the wiring of the Motors Check the polarity of the AA batteies Check the instillation of the gears
The robot does not move backward, even when the LED is coverd	Check the wiring of the motors Check the sensitivity of the variable resistor Move the robot to a slightly darker area, the sensor does not work in bright light
The robot circles backward even when the LED is coverd	Lower the sensitivity of the variable resistor Move the robot to a slightly brighter area, the sensor does not work in dark light
The robot makes the wrong directional movement when encountered with an obstacle	Check the motor wiring
One side twitches while the other walks normally	There is too much light, move to a darker area

Learn all about the electronic parts used in robots

Resistors

A resistor is an electronic component that is deliberately designed to restrict the flow of electrical current in a circuit. The higher the resistance value, the more it restricts the flow. The resistor will give the circuit a stable current thus giving protection to sensitive elements within a circuit from damage. The resistor is measured by its ability to offer resistance and this is defined in “Ohms”.

What is Ohms Law?
The Law basically brings together the relationship between Voltage (V), Resistance (R) and Current (I) as follows:

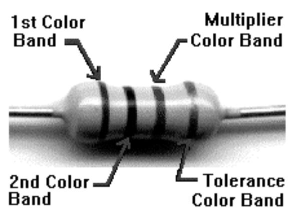
$$\textbf{Resistance(R) (ohm } \Omega\textbf{)} = \frac{\textbf{Potential Difference (V) in volts}}{\textbf{Current (I) in amperes}}$$

The official definition is:
A resistor offers a resistance of one ohm **Ω** if a potential difference of one volt drives a current of one ampere through it.

What’s an ampere? The unit for current is the ampere (A).
What’s Potential difference? Potential difference is a difference in electrical potential energy across each resistor and across a battery.

How do you determine the resistance of a resistor?

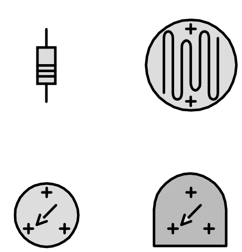
Resistors are color coded for easy reading. To determine the value of a given resistor look for the gold or silver tolerance band and rotate the resistor as in the photo above. (Tolerance band to the right). Look at the 1st color band and determine its color. This maybe difficult on small or oddly colored resistors. Now look at the chart and match the "1st & 2nd color band" color to the "Digit it represents". Write this number down. Now look at the 2nd color band and match that color to the same chart. Write this number next to the 1st Digit. The last color band is the number you will multiply the result by. Match the 3rd color band with the chart under multiplier. This is the number you will multiple the other 2 numbers by. Write it next to the other 2 numbers with a multiplication sign before it. Example: 2 2 x 1,000.To pull it all together now, simply multiply the first 2 numbers (1st number in the tens column and 2nd in the ones column) by the Multiplier

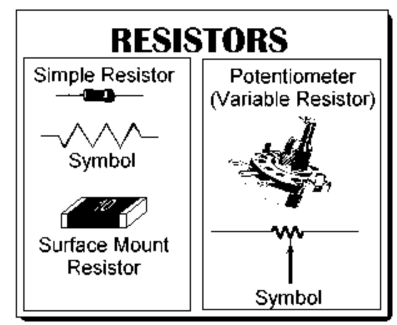


Resistor Color Code Chart

1st. & 2nd Color Band	Digit it Represents	-----Multiplier-----
BLACK	0	X1
BROWN	1	X10
RED	2	X100
ORANGE	3	X1,000 or 1K
YELLOW	4	X10,000 or 10K
GREEN	5	X100,000 or 100K
BLUE	6	X1,000,000 or 1M
VIOLET	7	Silver is divide by 100
GRAY	8	Gold is divide by 10
WHITE	9	Tolerances Gold= 5% Silver=10% None=20%

Common symbols used for resistors

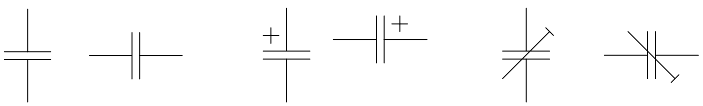




Learn all about the electronic parts used in robots

Capacitors
There are several types of capacitors but they all perform the same basic function; that is to store electric charge. Used in electronic circuits it consists of two or more metal plates separated by an insulating layer called a dielectric. Its **capacitance** is the ratio of the charge stored on either plate to the potential difference between the plates. The SI unit of capacitance is the **farad**, but most capacitors have much smaller capacitances, and the microfarad (a millionth of a farad) is the commonly used practical unit. Electrolytic and Mylar capacitors are used in this electronics kit. We use a combination of resistors and capacitors to suppress voltage fluctuations in the power supply and set the time period on the timer. Capacitors can also be used to remove any alternating current components within a circuit.

Mylar capacitors have an insulator, which is a flexible mylar film, so a large area can be rolled up into a compact package. They do not have a polarity. Capacitors with large values are usually **electrolytic.** They have a polarity (or direction) and are sensitive to levels of voltage.



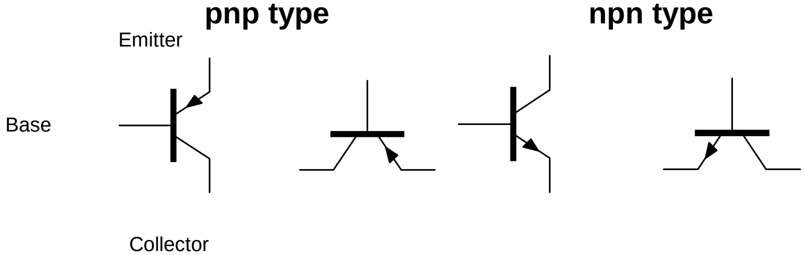
General Capacitor **Polarised Capacitor** **Preset Capacitor**

SI unit (symbol F) of electrical capacitance (how much electric charge a **capacitor** can store for a given voltage). One farad is a capacitance of one **coulomb** per volt. For practical purposes the microfarad (one millionth of a farad, symbol mF) is more commonly used. The farad is named after English scientist Michael Faraday.

Transistor
A transistor is a semi-conductor with the ability to amplify current. Transistors commonly consist of a tiny sandwich of germanium or silicon, alternate layers having different electrical properties because they are impregnated with minute amounts of different impurities. A crystal of pure germanium or silicon would act as an insulator (non-conductor). By introducing impurities in the form of atoms of other materials (for example, boron, arsenic, or indium) in minute amounts, the layers may be made either **n-type**, having an excess of electrons, or **p-type**, having a deficiency of electrons. This enables electrons to flow from one layer to another in one direction only.

Each transistor has three terminals called the Emitter, the Base and the Collector. When current flows into the base the emitter or the collector changes the current to a higher level.

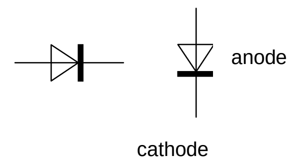
pnp type **npn type**



We use the transistors in this robot to turn on the LED (Light emitting diode) into a pulse form. We also use them to control the rotating director of the left motor. The transistors amplify the signal from the sensor to rotate the motor and could also be used to cause the LED to flash.

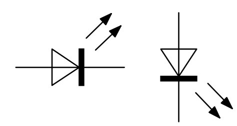
Diode

The diodes used in this circuit allow the flow of electrons one way only. This flow is from the anode to the cathode. Therefore, diodes are basically a one-way valve for electrical current. They let it flow in one direction (from positive to negative) and not in the other direction. Most diodes are similar in appearance to a resistor and will have a painted line on one end showing the direction or flow (white side is negative). If the negative side is on the negative end of the circuit, current will flow. If the negative is on the positive side of the circuit no current will flow.



Led

LED stands for Light Emitting Diode and it emits a light such as green or red. LEDs are simply *diodes* that emit light of one form or another. They are used as indicator devices. Example: LED lit equals machine on. They come in several sizes and colours. Some even emit Infrared Light that cannot be seen by the human eye.



IC Integrated Circuit

Integrated Circuits, or ICs, are complex circuits inside one simple package. Silicon and metals are used to simulate resistors, capacitors, transistors, etc. It is a space saving miracle. These components come in a wide variety of packages and sizes. You can tell them by their "monolithic shape" that has a ton of "pins" coming out of them. Their applications are as varied as their packages. It can be a simple timer, to a complex logic circuit, or even a microcontroller (microprocessor with a few added functions) with erasable memory built inside. The IC's used in this robot amplifies the output voltage from the sensor and these signals to the circuit controlling the left motor. Basically it is amplifying the weak signals from the light sensor or phototransistor, and sends them to the motors for controlling the robots movements.

We hope that you have enjoyed building this robot as much as we have designing it. We are particularly interested to hear your comments about this robot and any suggestions that you might have about improving our design or instruction manual.

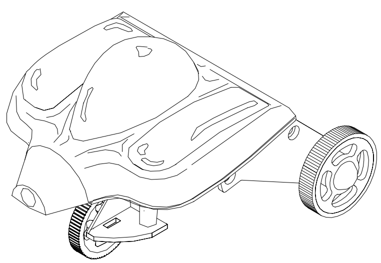
We will be developing more and more exciting and innovative robots to add to the iBOTZ range for you to build and programme. If you experience any difficulty building this robot please contact us on 020 8560 5678.

Also if any components are missing or have been lost by you, don't worry! We will send them to you for free! All we ask is that you tear off the form across the page and send it to us together with a stamped self-addressed envelope.

All the best

S. Devonshire
Head Developer, iBOTZ

Other robots in the iBOTZ range:



Sound Tracker MR-1001

Spare Parts-How to use the spare parts service

1.Tick the spare parts you require
2.Cut off this page along the scissor line
3. Send the form along with a stamped self-addressed envelope to:

IBOTZ
Division of Instrument Direct Limited
Spares Department
Unit 14 Worton Court
Worton Road
Isleworth
TW7 6ER

10 Brent Drive
Hudson, MA 01749

Part No.	Description	
Plastic Parts		
1002-001	Base	
1002-002	Battery cover F	
1002-003	Battery cover R	
1002-004	Case-L	
1002-005	Case-R	
1002-006	Connector-L	
1002-007	Connector-R	
1002-008	Cover-F	
1002-009	Cover-R	
1002-010	Foot-L	
1002-011	Foot-R	
1002-012	Gear-A	
1002-013	Gear-B	
1002-014	Gear-C	
1002-015	Leg-A	
1002-016	Leg-B	
1002-017	Motor cover	
1002-018	Motor frame	
1002-019	Crank	

IMPORTANT: If you have a problem, please don't contact your local shop but call our technical support line on 978-568-0484

Part No.	Description	
1002-020	Crown gear	
1002-021	Motor	
1002-022	Nut	
1002-023	Lock nut	
1002-024	Pinion gear	
1002-025	Pipe spacer-A	
1002-026	Pipe spacer-B	
1002-027	Pipe spacer-C	
1002-028	Screw-A	
1002-029	Screw-B	
1002-030	Screw-C	
1002-031	Screw-D	
1002-032	Screw-E	
1002-033	Washer-A	
1002-034	Washer-B	
Electric parts		
1002-035	PCB 1	
1002-036	PCB 2	
1002-037	9V Battery snap	
1002-038	AA Battery holder	
Sets		
1002-039	Wire set	
1002-040	Body set	
1002-041	Foot set	
1002-042	Leg set	
1002-043	Cover set	