REMOTE-CONTROL MACHINES | Contents

RECOMMENDATIONS

1. Please read the instructions, follow the safety rules, and keep them for reference. We recommend that you make the models in the given order. You will then be able to better understand the assembly and operation of the parts.
2. This is a kit designed for children over 8 years of age. It helps children develop mechanical thinking and problem solving skills.
3. Discuss the safety warnings and possible risks involved with the children before allowing them to build the models.
4. Do not insert the wire connectors and other components into any electrical sockets, which will cause a serious damage. Only the recommended batteries are allowed for use with this kit.
5. CLEANING:
   - Before cleaning, remove the batteries.
   - Use only a cloth that has been slightly dampened with water.
   - Never use soap or detergent.

⚠ WARNING TO PARENTS

This kit is not suitable for children under 3 years of age. It contains small parts that a child could swallow. This kit must be kept out of the reach of very young children.

Receiver/Battery Holder

Insert three AA batteries (1.5 V) into the combination receiver/battery holder. The polarity of the batteries and the markings on the battery compartments should match.

To later remove a battery from the holder, use the "B" end of the part separator tool.

Remote Controller

1. Lightly press and slide the lid outward to open it.
2. Insert two AA batteries (1.5 V) and pay attention to the polarity of the batteries and the markings on the compartments.
3. Slide back the lid.

SAFETY GUIDELINES

1. Regular, non-rechargeable batteries must not be recharged.
2. Rechargeable batteries can be charged only under the supervision of an adult.
3. Do not force open the battery.
4. Do not throw the battery into the fire.
5. Pay attention to the correct polarity.
6. Do not short-circuit batteries. They could explode!
7. Do not mix new and used batteries.
8. The exhausted batteries must be disposed of as hazardous waste.

WARNING

1. Remove the batteries when not planning to use the device for a long period of time.
2. Misuse of batteries can cause them to leak, which damages and corrodes the area around the battery, creating the danger of fire, explosion, and personal injury.

This kit offers children a new experience with remote control toys. It incorporates a touch pad remote-controller and three geared motors into a set of building components. Children can use the building blocks to construct a series of machines, and then control them using the six capacitive sensors (touch pads) on the remote control. This kit allows children to create models and learn about electricity, physics, and mechanics in a hands-on way.

Fig. 1 shows you the electronic parts of this kit, which include:

- **A.** Remote Controller
- **B.** Receiver/Battery Holder
- **C.** Geared Motors

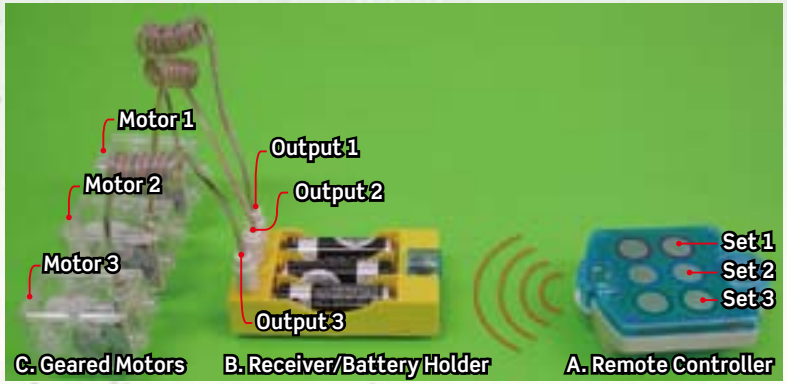

Fig. 1 The Remote-Control Machines system

A. REMOTE CONTROLLER

1. Operating Principle

When the user's fingers approach the touch pad of the remote controller, the capacitance will change. The driver IC (integrated circuit) of the touch pad determines the amount the capacitance has changed and converts it into coordinates (X, Y, θ angle). In this way, the touch pad is able to detect the movement of fingers. The touch pad is not only easy and flexible to use, but environmentally friendly because it reduces the electronic elements needed for assembly.

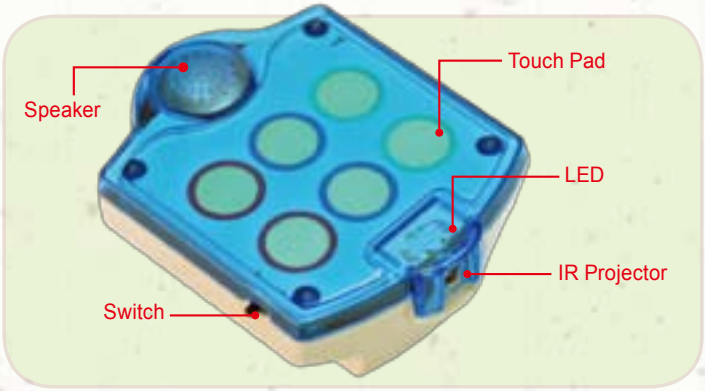

Fig. 2 The front side of the remote controller

Fig. 3 The back side of the remote controller

2. IR Remote Control (Infrared Remote Control):

The remote controller uses an infrared beam to send control signals to the receiver. It is directional (the infrared beam has to be outputted toward the receiver) and has a short-distance range (about 20 feet, or 7 meters, in general).

3. The three sets of touch pads correspond to the three outputs on the receiver/battery holder from left to right. Each set of touch pads controls the rotation of the corresponding output motors, one turning them clockwise and the other counterclockwise. When the touch pad is touched and the signal received, the speaker and the LED will produce sound and light effects.

4. The user can touch three touch pads (one in each set) at the same time so that the three corresponding output motors can all be activated at the same time. However, touching the two touch pads at the same set simultaneously won't cause any action because the motor cannot move forward and in reverse at the same time.

5. Two AA batteries (1.5 V) are needed. Set the switch to OFF when not in use in order to save energy.

B. RECEIVER/BATTERY HOLDER

When the IR receiver receives a message from the remote controller, the built-in IC chip will judge which corresponding touch pads were touched, and then convert the control message into the corresponding electrical outputs. Three AA batteries (1.5 V) are set in series in the receiver/battery holder. Each output gives a 3 V direct current.

This kit introduces children to the principles of wire communications and remote control technology with this simple IR remote-control device that has three corresponding normal outputs. It instructs children to build specific models with different remote-control functions, and encourages them to design and build their own models using their creativity. The models can each incorporate up to three motors which can be installed in different ways to allow the models to move in six directions (that is, forward or backward, left or right, up or down).

When you finish playing with this kit, please remove one of the batteries from the receiver/battery holder because the receiver/battery holder will still consume some electricity even in a standby. This will save energy and keep it safe.

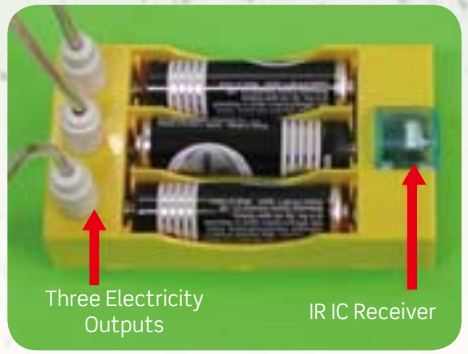

Fig. 4 Receiver / Battery Holder

C. GEARED MOTOR WITH WIRE CONNECTOR

The interior structure of the geared motor with wire connector is shown on Fig. 5 and Fig. 6. When the motor is activated, the power is transmitted from the motor to the gearbox, which contains three gear sets: Set A gives a gear ratio 20 to 8, Set B gives a gear ratio 28 to 8, and Set C gives a gear ratio 30 to 8. The overall gear ratio of the system is 20/8 x 28/8 x 30/8; that is, 32.8125 to 1. In other words, the motor has to turn 32.8125 times to turn the axle X once. If the motor turns at 3200 rpm, the axle X in this system will turn at 100 rpm. In other words, the speed of the axle X will decrease by 32 times but the torque (turning force) will increase by 32 times.

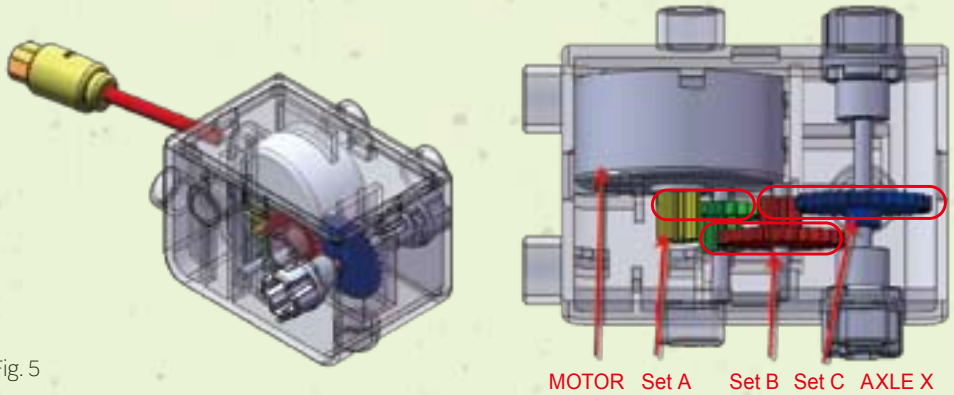

Fig. 5

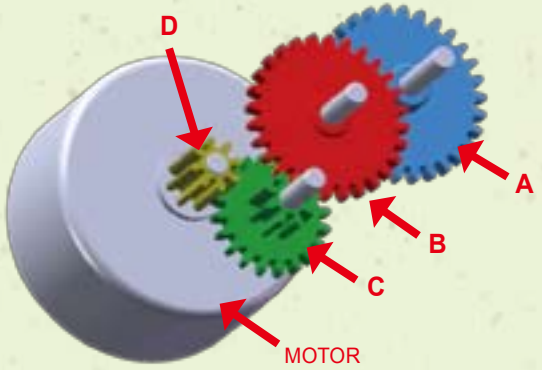

Fig. 6