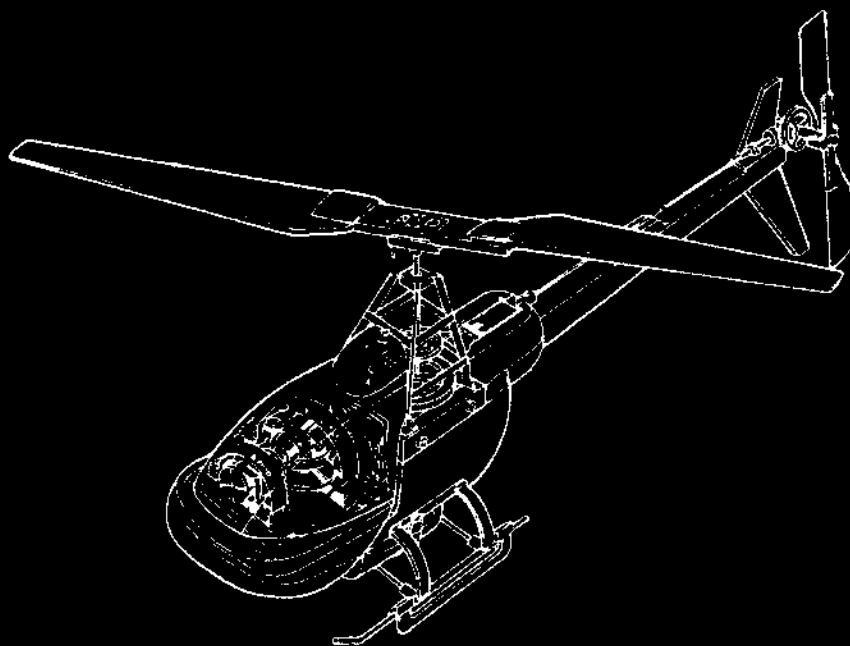


# REVOLUTOR

REVOLUTOR

H-610

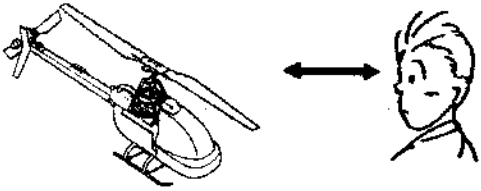
## OPERATING INSTRUCTIONS



**KEYENCE**  
KEYENCE CORPORATION

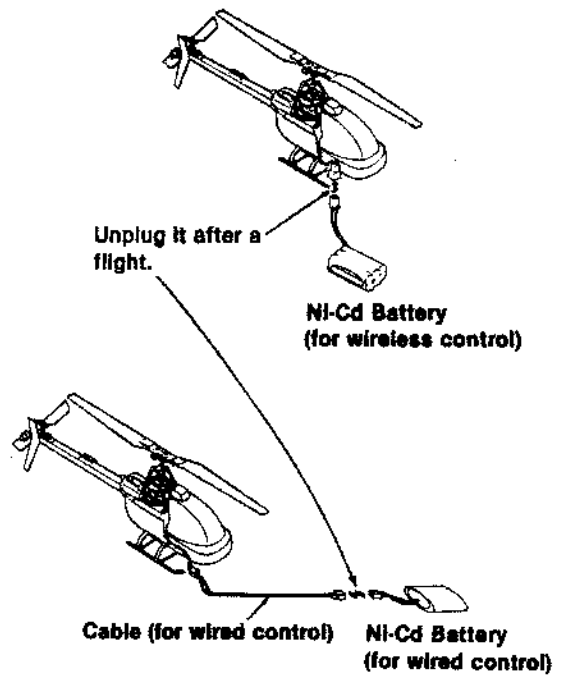
Be sure to observe the following precautions requisite for safety operation.

- Keep your eyes away from the propellers even when they are at a stop before or after connecting the battery. The propellers (main rotor and tail rotor) may occasionally start revolving.

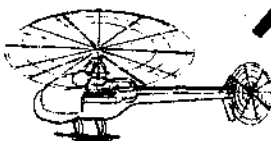
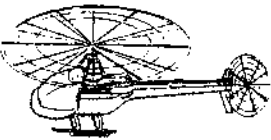


Don't approach the propellers, which even at a stop may start revolving suddenly to do hurt particularly to your eyes.

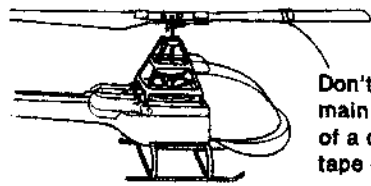
- Since an Ni-Cd battery is powerful enough to run high-power current, it may cause an unexpected accident (e.g. emission of smoke or combustion). In order to prevent any accident, be sure to remove the Ni-Cd battery and keep it in a place carefree from shorting with a wire, etc. when the radio control helicopter is not in use.



- While it is flying in the air, take meticulous care not to allow the propellers to hit your eyes. Keep more than 1m away from the helicopter. Absolutely avoid peeping in from above or under or flying it over other persons. Please bear in mind these warnings without fail when flying the radio control helicopter.



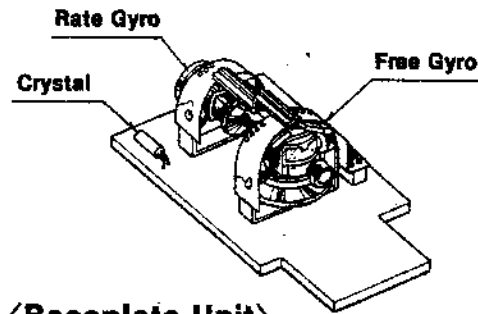
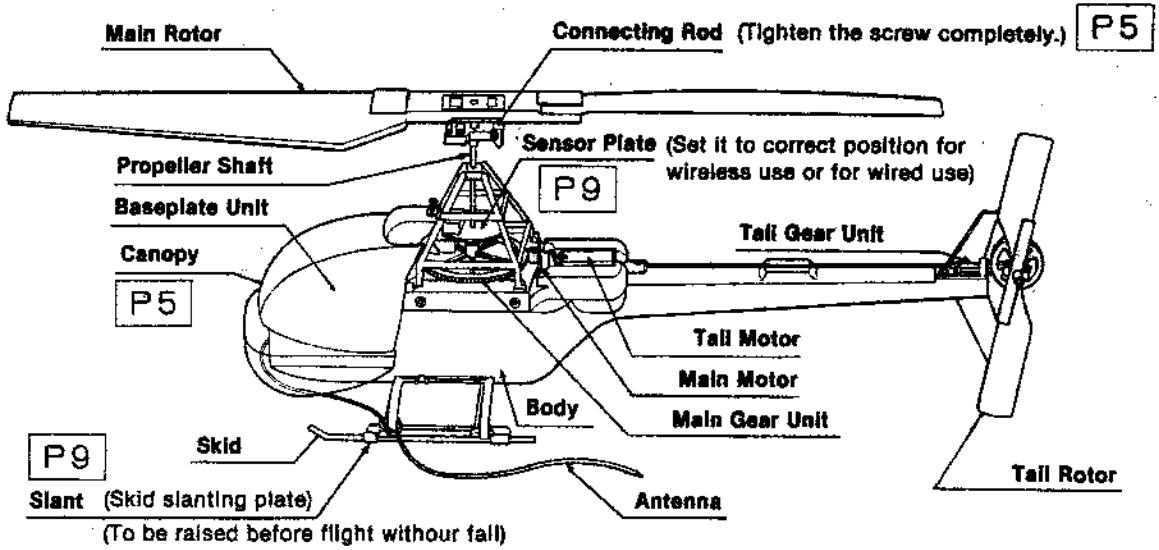
- When the larger propeller (main rotor) is broken, do not reuse it by repairing with a cellulose tape, adhesives, etc. Once broken, it may tear again to bring about danger.



Don't repair the main rotor by use of a cellulose tape or adhesives.

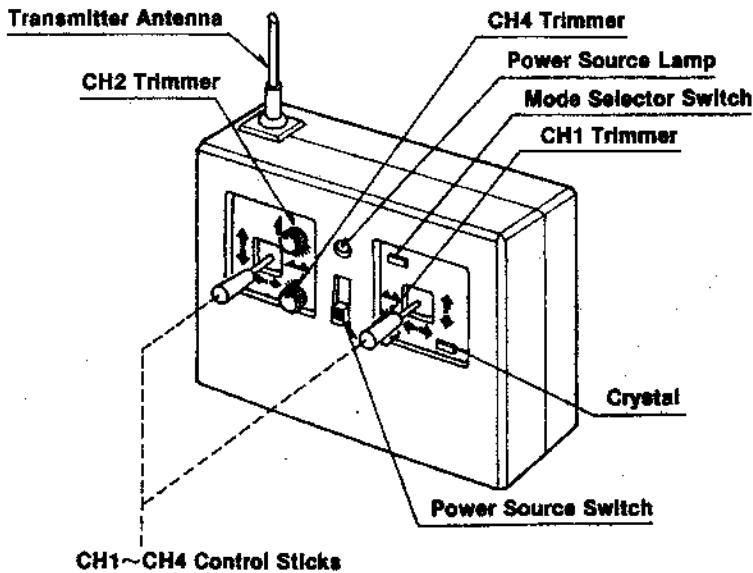
# 1 Components

## <Main Body>

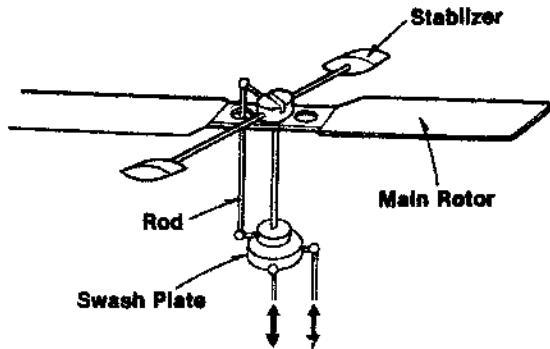


## <Baseplate Unit>

## <Transmitter>

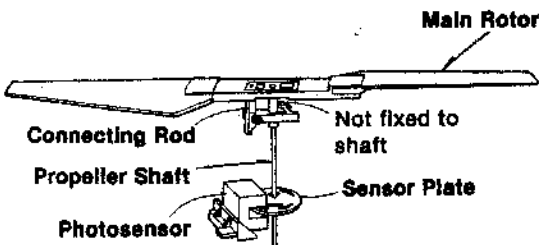


## 2 Operation Principles



Conventional System

Fig. 1



H-610's System

Fig. 2

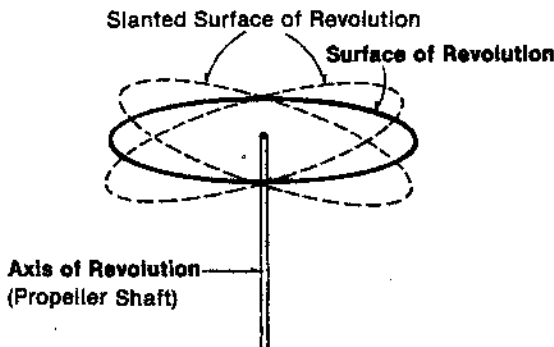


Fig. 3

Fig. 1 shows the simplest form of conventional system to explain the principles of operation plainly.

When the swash plate is moved in the arrow direction and slanted, the stabilizer (equipped with a bob at each of both ends) connected by the rod from the swash plate increases and decreases in pitch (twist) periodically by a turn. This is called "cyclic pitch control".

This stabilizer flexes upward when increased in pitch, and downward when decreased in pitch. Thus the stabilizer undergoing cyclic pitch control inclines against the axial direction. Since the stabilizer is connected directly with the main rotor, its inclination brings the main rotor into cyclic pitch control, thereby making the main rotor incline against the axis of revolution. By changing the swash plate in slanting direction, the main rotor can be slanted in any direction (forward, back, left, and right) so that the radio control helicopter can be moved in the desired direction.

Mentioned above is the conventional method. Not only the complex mechanism but the servo motor to move the swash plate could by no means make the radio control helicopter small in size and light in weight.

Next is explanation of the system used for the H-610. As shown in Fig. 2, there is no mechanical connection to the main rotor at all. This system is quite a new and well-contrived one. The main rotor is fixed to the propeller shaft through the connecting rod. The sensor plate and the photo sensor are used to detect the position of the main rotor to the body. When the main rotor comes to a certain position as viewed from the body according to signal supplied from the photo sensor the motor is increased in power output. At this time, a high torque (turning effort) is applied to the shaft, but since the main rotor cannot increase in speed immediately, there takes place a torsion between the main rotor and the shaft. The shaft and the main rotor are so connected by the connecting rod that the said torsion will lead to a variation of the main rotor in pitch. This is the very cyclic pitch control explained above with the conventional system, and by making use of this method, the system of the H-610 slants the main motor electrically.

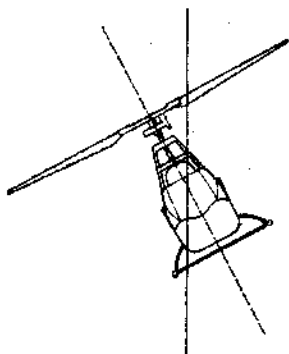
Like in the case of the conventional system, the main rotor can be slanted in any direction (forward, back, right, or left) by varying the timing to increase the motor in power output, so that the radio control helicopter can be moved in the desired direction. (see Fig. 3)

In addition, the H-610 is equipped with gyrosensors (free gyro and rate gyro) to control the position of the body. The free gyro detects the forward, backward, rightward, or leftward inclination of the body, and controlling the slanting movement of the main rotor as mentioned above, keeps the body horizontal. On the other hand, the rate gyro detects the turning of the body, and controlling the number of revolutions of the tail rotor, controls the turning of the body.

By the way, it is well known that every helicopter needs a tail rotor in order to resist the main rotor's counter torque. In actual fact, however, the body is subject to sideslip though the tail rotor keeps the body from turning. Resisting the sideslip, the helicopter is banked while hovering in the air. (see Fig. 4)

For the sake of positional control by the free gyro of the H-610, the free gyro has been so designed as to be horizontal with the body previously banked a little. Such a function is termed a slant (skid slanting plate).

It is obvious from the above explanation that the connecting rod, sensor plate, and slant are very important parts of the H-610. Cautions on these parts are summarized below and detailed in the text (5 Flight Procedure), which we wish you will carefully read and keep in mind.



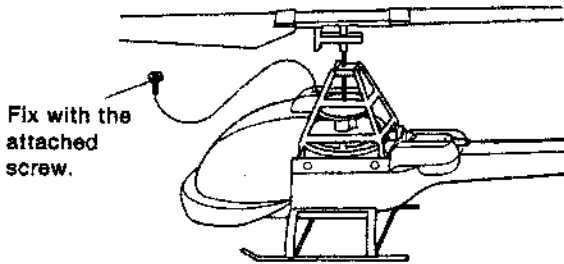
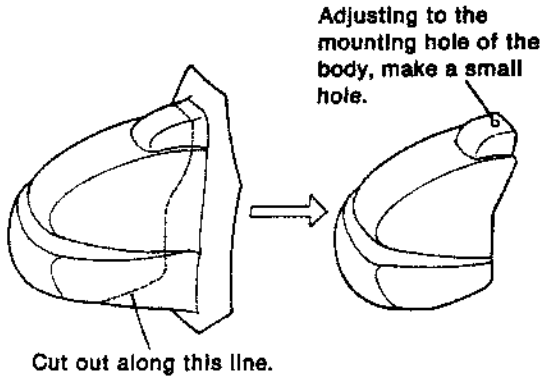
**Fig. 4**

While hovering, the radio control helicopter slants a little to resist the sideslip force occurring at its tail.

<b>Connecting Rod</b>	<b>P5</b>	Fix the connecting rod securely with setscrews. If it is left loose, the H-610 will not fly well.
<b>Sensor Plate</b>	<b>P9</b>	Its position relative to the shaft is very important. Since the position differs for different use i.e. wireless control or wired control. Make sure by reading this instruction book and set it to the correct position.
<b>Slant (Skid Slanting Plate)</b>	<b>P9</b>	If this plate is not raised to keep the body aslant, the free gyro will fail to function properly. Before flying the helicopter, raise this plate without fail.

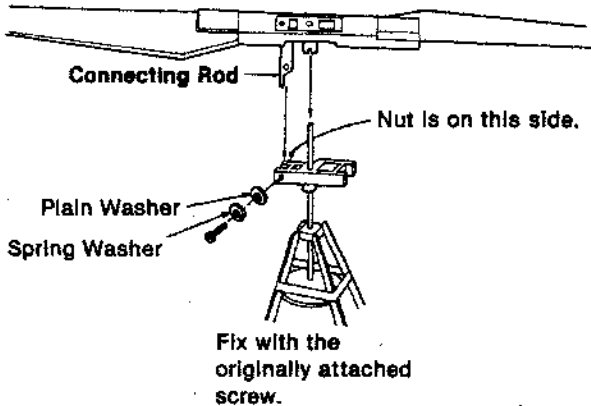
### 3 Helicopter Assembly

1. Cut out the canopy and attach the desired painting. (Refer to the painting samples on the packing case.)



Be sure to mount the canopy. Without the canopy, the free gyro blown by the wind will not function properly.

2. Mount the main rotor.

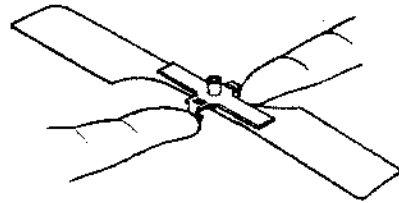
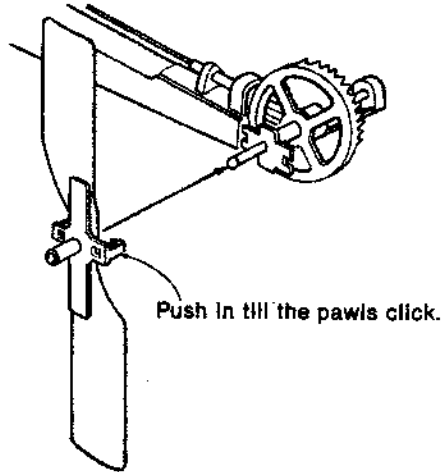


#### Caution

Be sure to use the attached washers in order to secure fixity with the screw. Loosening, even a little, will prevent the helicopter from flying normally.

Some main rotors are taped for balancing at the time of delivery from the factory. Such a main rotor should be used without removing the tape.

3. Mount the tail rotor.



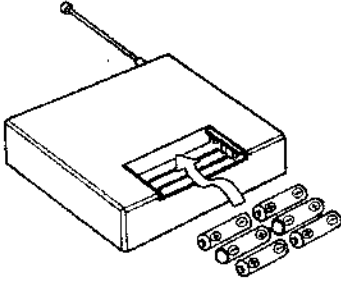
When demounting the tail rotor, pull it out after slightly unbending the pawls of the tail rotor with forefingers of both hands as pictured above.

4. Cut out the decal provided and attach it to the body to your liking. (Refer to the painting samples on the case.)

## **4 Battery Set Up**

### **<Transmitter>**

After making sure that the power source switch has been set to OFF, remove the battery compartment lid and set 6 U-3 dry cells in the battery compartment.



### **<Main Body>**

There are two kinds of batteries contained in the body, one is for wired control and the other is for wireless control.

Wired control is to fly the radio control helicopter by supplying it with power from a large-capacity battery placed on the floor through a cable.

And wireless control is to fly it completely wirelessly by mounting battery to the main body.

Since wired control permits a longer flight, those who are not accustomed to 4-channel operation are recommended to practice wired control first.

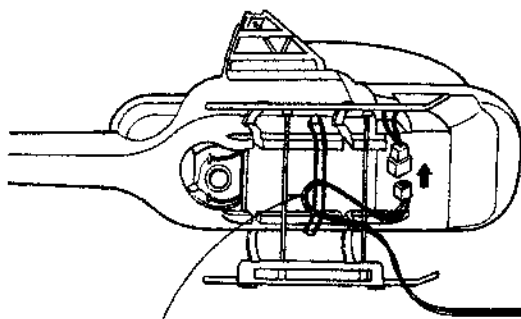
### **Caution**

When connecting the battery in the main body, make sure that the transmitter switch has been set to OFF without fail.

No switch is provided inside the main body. Power is supplied to the circuit through connection by use of the connector. As long as the power source switch of the transmitter is kept at the OFF position, neither the propellers nor the gyro will rotate.

## <Main Body>

### For Wired Control



Pass the cable through the skid and the attached rubber for the sake of balancing.

**Ni-Cd Battery (0P-90611) 7.2V 290mAh**

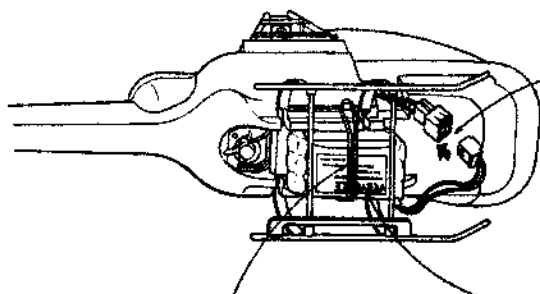
For charging the Ni-Cd battery, follow the instructions stated in the instruction book of the charger.

**Ni-Cd Battery**

**Attachment Cable for Wired Control**

Connect the helicopter connector and the Ni-Cd battery connector to the wired-control cable. At this time, use care to have red lines meet. Absolutely avoid using excessive force or connecting inversely.

### For Wireless Control



Fix with the attached rubber.

Connect the helicopter connector and the battery connector by making the red lines meet. Absolutely avoid using excessive force or connecting inversely.

Set the Ni-Cd battery adjusting its position to the projections on the tail, right, and left sides.

**Ni-Cd Battery (0P-8952) 7.2V 120mAh**

For charging the Ni-Cd battery, follow the instructions stated in the instruction book of the charger.

### The center of gravity

It has been so designed that in the case of wireless control the center of gravity of the helicopter will come to the main rotor shaft. When mounting the battery, it should be adjusted securely to the projections on the backside of the body. In the case of wired control, the gravity center of the helicopter will be fairly back of the main rotor shaft. But, since the weight of the battery is saved to the advantage of power performance, the helicopter can be flired as it is.

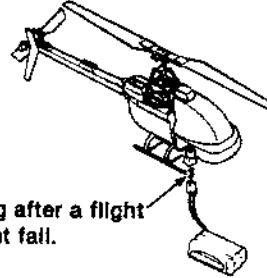
### Caution

Whether wired control or wireless control, hold the body in one hand and connect the connector by the other hand taking care so that the propellers starting unexpectedly may not hurt hands, face, etc.

### Caution

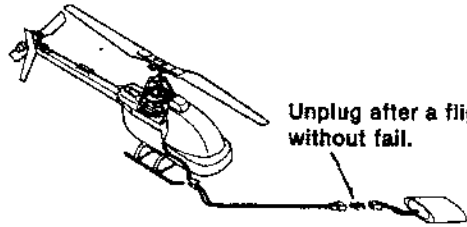
After a flight, be sure to remove the battery from the connector of the helicopter and keep it in a safe place.

### Wireless Control

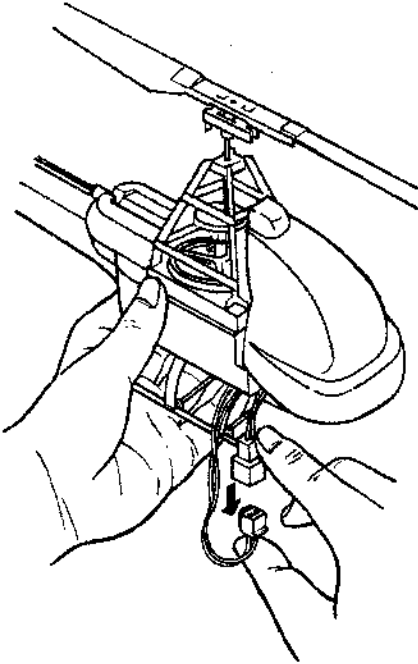


Unplug after a flight without fail.

### Wired Control



Unplug after a flight without fail.



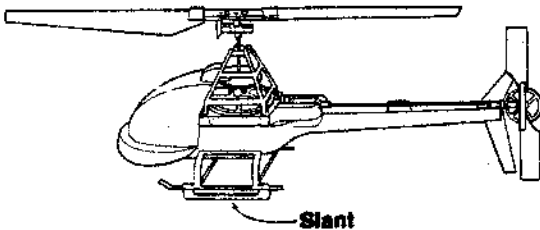
When connecting the battery, keep your eyes away from the propellers.

## 5 Flight Procedure

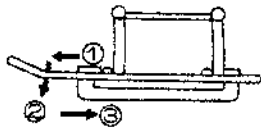
In order that the radio control helicopter may fly to your complete satisfaction, it is very important to set the slant, sensor plate, and connecting rod correctly by referring to the following instructions:

### • Slant (Skid Slanting Plate)

Raise this slant before flight without fail.



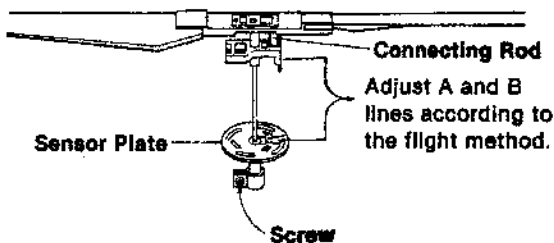
#### (How to raise Slant)



- ① Pull it forward.
- ② Turn 90° and raise it.
- ③ Pull it back and fix it.

### • Sensor Plate

Differs in position between wireless control and wired control. Be sure to observe the following and set it in correct position.



#### For wireless control

Loosen the screw, adjust the sensor plate till the line shown by A is just under the main rotor on the connecting rod side, and then tighten the screw to fix it.

#### For wired control

Likewise adjust the sensor plate till the line shown by B is just under the main rotor, and then fix it.

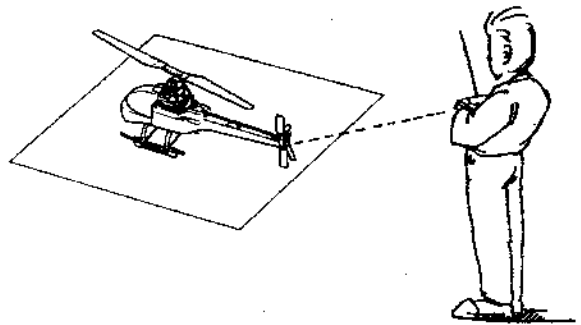
Though this adjustment does not require so precise accuracy, it is necessary to have the line of A or B just under the main rotor.

### • Connecting Rod

Make sure again that the screw holding the connecting rod is not loose.

After setting the parts described above, launch the radio control helicopter into the air by taking the following steps:

1. Place the helicopter on a flat floor. It should be so placed as to have its tail facing the operator. Take care so that the antenna may not wind around the propeller.

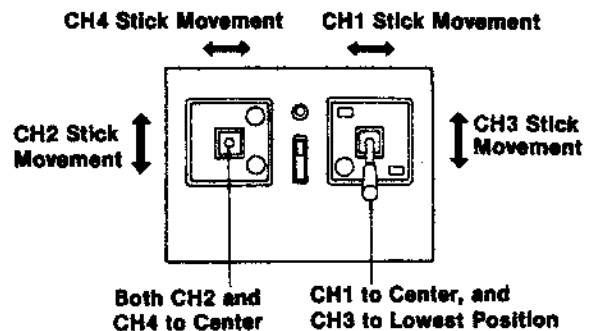


It cannot be launched normally from a sloped floor. Let it take off from a flat, horizontal floor without fail.

2. Make sure that the free gyro is stationary. Set the power source switch to ON without touching the transmitter sticks.

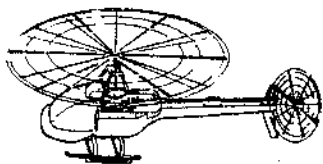
### Caution

If the free gyro is swinging, it will fail to make a normal start. Making sure it has stopped completely, set the power source switch of the transmitter to ON.



Rate Gyro) ..... Start rotating.  
 Free Gyro) .....  
 Main and Tail Rotors..... At a stop.

3. About 8 seconds after both the gyros start rotating, the propellers start rotating.



Rate Gyro..... Rotating.  
Free Gyro..... Rotating.  
Main and Tail Rotors..... Start rotating.

The propellers start rotating after the free gyro rotation gets stabilized. After setting the power source switch of the transmitter to ON, do not bring your hands or face near the propellers.

※ When the CH3 stick is set at the lowest position, both the main and tail rotors rotate slowly and unevenly. In an extreme case, the tail rotor fails to rotate. But this is not a trouble. As for the main rotor which keeps on rotating, the safety device stops it from rotating for the sake of protecting men and the propeller when a certain force works upon it. If such a case occurs, start with Step 2 of the Flight Procedure **P9** over again.

Now the radio control helicopter is ready for a flight.

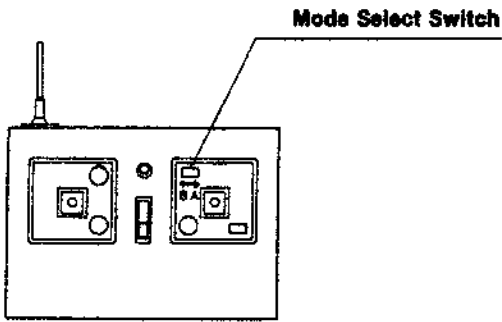
### Cautions

- Duration of flight of REVOLUTOR H-610 is about 1 minute on wireless control, or about 3 minutes on wired control. (It may be a little shorter depending upon the condition of the battery in use.)
- REVOLUTOR H-610 has been intended for indoor use. Outdoors it cannot be used if any slight wind blows.
- Do not fly it over or near people. Please understand that our company is not responsible for any accident resulting from such reckless flights.

### Note

When taking the helicopter body, hold the middle part of the main rotor. This method is relatively free from danger even if something may cause the rotors to rotate.

## 6 Transmitter Control

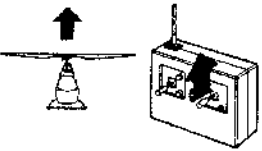
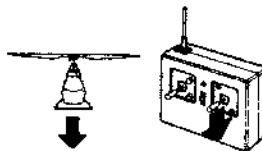
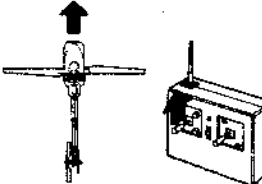
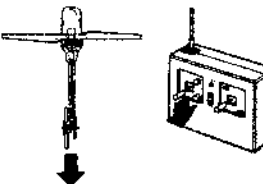
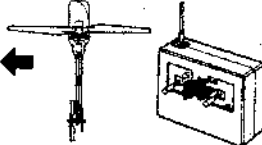
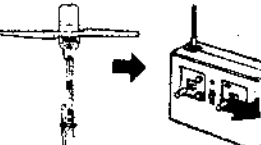
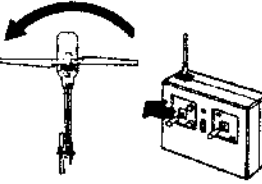
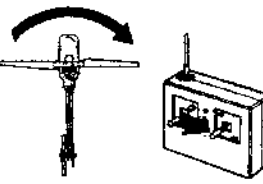


The mode select switch is used for exchange of control stick functions.

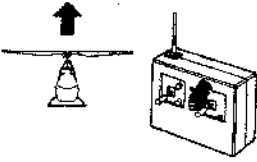
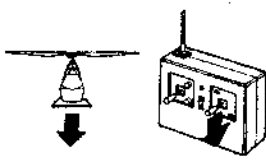
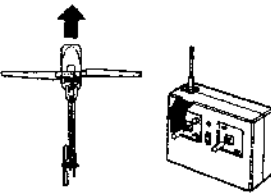
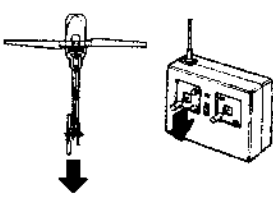
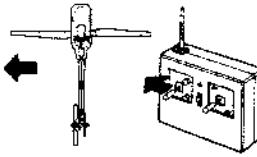
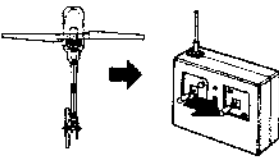
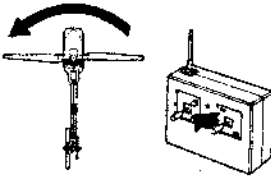
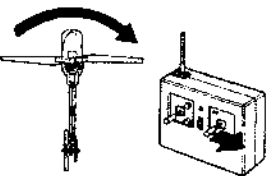
**Mode A...** Generally used for control of radio control helicopters in Japan. Those who are going to set about a regular radio control helicopter hobby are recommended to practice in this mode.

**Mode B...** Forward, rearward, leftward and rightward controls are concentrated to the left side sticks. Operation in this mode will be easier for beginners of 4-channel operation.

### Mode A

<p><b>UPWARD</b></p>  <p>CH3 Stick UP</p>	<p><b>DOWNWARD</b></p>  <p>CH3 Stick DOWN</p>	<p><b>FORWARD</b></p>  <p>CH2 Stick UP</p>	<p><b>REARWARD</b></p>  <p>CH2 Stick DOWN</p>
<p><b>LEFTWARD</b></p>  <p>CH1 Stick LEFT</p>	<p><b>RIGHTWARD</b></p>  <p>CH1 Stick RIGHT</p>	<p><b>LEFT TURN</b></p>  <p>CH4 Stick LEFT</p>	<p><b>RIGHT TURN</b></p>  <p>CH4 Stick RIGHT</p>

## Mode B

<p><b>UPWARD</b></p>  <p>CH3 Stick UP</p>	<p><b>DOWNWARD</b></p>  <p>CH3 Stick DOWN</p>	<p><b>FORWARD</b></p>  <p>CH2 Stick UP</p>	<p><b>REARWARD</b></p>  <p>CH2 Stick DOWN</p>
<p><b>LEFTWARD</b></p>  <p>CH4 Stick LEFT</p>	<p><b>RIGHTWARD</b></p>  <p>CH4 Stick RIGHT</p>	<p><b>LEFT TURN</b></p>  <p>CH1 Stick LEFT</p>	<p><b>RIGHT TURN</b></p>  <p>CH1 Stick RIGHT</p>

As shown in the tables above, sticks for leftward/rightward movements and sticks for left/right turnings are exchanged in the

case of Mode B. If this is hard to learn by heart, stick the seal (of the attachment decal) on the transmitter directly.

## 7 Flight Practice

The following explanation is for operation in Mode A. Those who are going to practice in Mode B are requested to read by replacing CH1 with CH4 and CH4 with CH1 as to the sticks and the trimmers.

The method of practice does not differ between wireless control and wired control for flying the H-610.

### Trimmer Adjustment (Transmitter)

The purpose of the trimmer adjustment is to enable the radio control helicopter to rise up just above when CH3 stick (for motor power) is moved up gradually while leaving other sticks (CH1, 2 and 4) in the respective center positions. This is necessary for flying the radio control helicopter and, therefore, the adjustment should be made without fail. Also, the trimmer adjustment is required after the mode is changed.

1. Make ready for a flight by taking the procedure stated in ⑤.
2. After the rotors start rotating, move up CH3 stick gradually while leaving CH1, 2 and 4 sticks in the respective center positions until the helicopter is about 30cm~50cm high from the floor level.

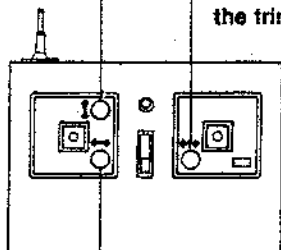
3. At this time, the helicopter rises straight and the trimmer has to be so adjusted as to keep the helicopter from turning or moving in an unexpected direction. The adjustment should be made after landing the helicopter and switching off the power source of the transmitter. When flying it again, be sure to have it rise to a height of 30cm~50cm. If the height of the helicopter is about 10cm, the helicopter may lose balance due to a chopping wind as it blows air against the floor.

#### CH2 Trimmer

When the helicopter is moving forward, turn the trimmer to the left, and when the helicopter is moving rearward, turn the trimmer to the right.

#### CH1 Trimmer

When the helicopter is moving rightward, turn the trimmer to the left, and when the helicopter is moving leftward, turn the trimmer to the right.



#### CH4 Trimmer

When the helicopter is turning rightward, turn the trimmer to the left, and when the helicopter is turning leftward, turn the trimmer to the right.

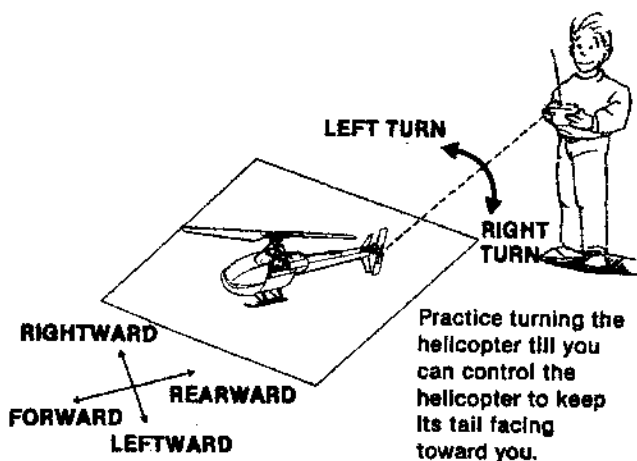
4. After adjusting the trimmer, make sure that the free gyro is stationary, then set the power source switch of the transmitter to ON again, and flying the helicopter, make sure of the effect of the adjustment.

## Flight Practice

Please practice and learn how to make the helicopter hover in the air by taking steps 1~3 given below:

### Step 1 (helicopter turning control)

1. Make ready for a flight by taking the procedure stated in [5].
2. Place the helicopter on a smooth floor, move CH3 stick a little up (to such an extent as will not let the helicopter rise), and moving CH4 stick, right and left, get the knack of turning the helicopter. (Since CH4 stick is inoperative unless CH3 stick is moved up even a little, be sure to move up CH3 stick to such an extent as will not let the helicopter rise.)
3. Next, practice control to keep its tail facing toward you. At this stage, it is still too early to make the helicopter rise up. To have a knack at keeping the helicopter in such a position is very important, because the direction in which to move the helicopter is determined on the basis of this position of the helicopter with its tail facing toward you.



Practice turning the helicopter till you can control the helicopter to keep its tail facing toward you.

It is not possible to make the helicopter hover completely by such trimmer adjustments only. No more adjustment is necessary if the the helicopter could be made to rise nearly straight.

## Step 2

(Keeping a constant height during helicopter turning control)

1. Moving up CH3 stick gradually, let the helicopter rise to a height of about 30cm~50cm. Then operate stick CH4 as you practiced in Step 1 to keep the helicopter from turning and get its tail to face toward you.
2. After a while (2~3 seconds later), the helicopter begins moving forward, back, right, or left. Then move down stick CH3 quickly to let down the helicopter.

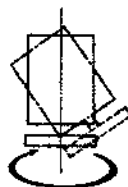
Keep practicing till you master step 1 and step 2. Otherwise, you will never be able to acquire the skill of controlling the helicopter for forward, rearward, rightward and leftward movements.

### **Notes:**

1. After landing the helicopter, switch off the transmitter without fail. An interval (about 15 seconds) is necessary between flights. When retrying, make sure that the free gyro is completely stationary. This is because the landing shock caused the free gyro a movement called 'precession'\* making it inoperative.
2. When the helicopter slips sideways toward a wall, move down CH3 stick to the lowest position and switch off the transmitter. Rather than dashing against the wall, falling down to the floor will result in less damage.
3. When launching it again, get it to rise to a height of about 30cm~50cm from the floor level. If at a height of about 10cm, the helicopter may lose balance by a chopping wind as it blows air against the floor.
4. When the main rotor hits against a thing, it comes to a standstill as the safety circuit operates. In such a cause, it will not restart rotation unless the transmitter is once switched off and then switched on again.

## **※ Precession**

Precession means oscillation of gyro caused by a sudden sideway acceleration.



## Step 3

(Forward, rearward, leftward, and rightward control)

1. Controlling the helicopter so that it way not turn, get it to rise to a height of about 30cm~50cm.
2. When the helicopter moves left, move CH1 stick right, and when the helicopter moves right, move the stick left. When the helicopter moves forward, move CH2 stick down, and when the helicopter moves rearward, move the stick up.

Mastering the above-mentioned practice from Step 1 to Step 3, you will be full-fledged in hovering control.

Practicing up to step 3 takes about 1 week. Though you may think it a difficult, practice with the H-610 is much easier than with other prevalent radio control helicopters. Since hovering is the basis for all kinds of control, try hard till you master the skill.

### **Notes:**

1. The free gyro used for the H-610 is a simple type model plane gyro, which may get inoperative when precession caused by a sudden sideway movement takes place. Controllable movement speed is 20cm/sec. at maximum. If moved at a speed higher than 20cm/sec., precession of it may cause the H-610 to turn over. In such a case, land the helicopter immediately.

- The attainable distance of the radio wave is 10m approx. Even within 10m, the main rotor may fall or stop completely, thereby causing the H-610 to fall.

This failure is attributable to the lowering of the radio wave strength consequent on the interior conditions of the building. In such a case, set up the transmitter and fly the H-610 there, or change the place. Even though the transmitter lamp is on, the battery can be emaciated. Replace it and try with a new one.

- In the state mentioned above, the main rotor which has stopped once will remain stationary as it is. To have it restart revolution, switch off then switch on the transmitter.
- The H-610, during a flight, comes down as the battery is nearing the end of its service life even though CH3 stick is at the highest position. The H-610 in that state cannot be controlled easily. In such a case in a gym or a lofty hall, the H-610 had better be lowered earlier.
- The motor immediately after a flight is very hot. Before flying it again, wait till it cools down.

**A continuous flight even under wired control should preferably be 3 minutes. Care should be taken that a longer flight will deteriorate the motor and gyros heavily.**

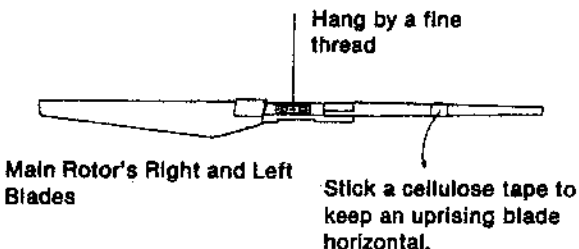
## 8 Cautions in Use

- The attachment cable to be used for wired control should not be changed in construction but be used as it is.
- Do not make power-supply connection to the H-610 from the charger (included in option items) designed for use with the Ni-Cd battery in the body of the H-610. Connection from the charger insufficient in power-supply capacity will never cause the H-610 to fly.
- Do not feed the rotor motors and gyro motors with any lubricant. Lubricant will have an adverse effect on their performances.

## 9 Main Rotor Adjustment

In general, the main rotor adjusted before delivery from the factory need not be readjusted. The following adjustments are stated for your reference.

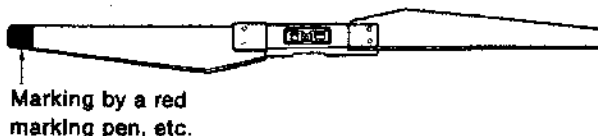
### 1. Static Balance Adjustment



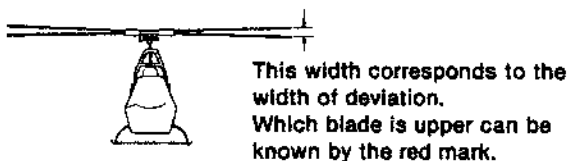
### 2. Tracking Adjustment

To keep 2 blades on the same surface of revolution is termed 'tracking.' Since it is difficult to complete the tracking applicable to both wired flight and wireless flight of this model helicopter, we advise you to adjust the tracking to wireless flight. In this case, the H-610 under wired control can be flown without hindrance though the tracking deviates a little. If your H-610 has been designed for wired flight only, the tracking can be adjusted to wired flight.

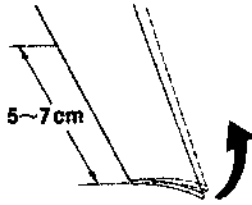
- First put a mark on one blade by use of a red marking pen, etc.



- Next, place the H-610 on the floor, and raise revolution speed to such an extent as will barely make the body rise. (Letting it take off completely is also all right.) Then check which blade of the two is upper. When watching the blades, be 1 m or more away from the place for safety's sake.



- Reduce the upper blade pitch (twist) by pressing fingers against the blade.



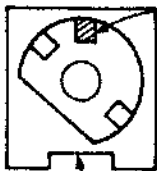
Cross Section of Blade  
(as viewed from end part)

Pressing by fingers, slacken the pitch. The pitch adjustment in the range of 5~7cm from the end of the blade will suffice for the purpose. The adjustment can also be made by increasing the lower side blade pitch.

## 10 Main Body Trimmer Adjustment

The trimmers of the main body have already been adjusted since the delivery from the factory. They should never be touched except for replacement of gyros. In case that the adjustment cannot be made completely with the transmitter trimmers after replacement of gyros, adjust the trimmers on the baseplate located topmost (visible) of the helicopter litter by little according to the instructions given below.

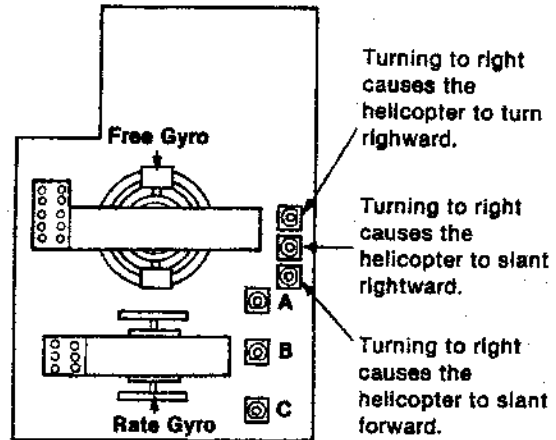
The adjustment position is marked on each trimmer. When the desired performance cannot be regained due to maladjustment, return it to the original position according to the marked indication, and then make the correct adjustment.



Marked on the opposited side of the notch. When returning, return it to this position.

Notch

## Adjustment Method



Three trimmers, A, B, and C are used to adjust gyros in sensitivity.

Increasing gyros in sensitivity causes transmitter sticks to work dully, and reducing gyros in sensitivity causes them to work sharply. These trimmers have been adjusted in optimum positions and should never be touched.

For instance, reducing foward/back and right/left gyro sensitivity (that is, making transmitter sticks work sharply) causes the H-610 to fly unstably or to turn over. On the contrary, increasing the sensitivity causes the H-610 to hunt (rock irreglarly).

Reference: A..... Left/right gyro sensitivity  
B..... Forward/back gyro sensitivity  
C..... Turning gyro sensitivity

Each of them (A, B, C), when turned to right, increases in sensitivity.

### Caution

Also, there are trimmers other than those six trimmers stated above. They should never be touched. Touching any of them will make the H-610 uncontrollable.

## Repair

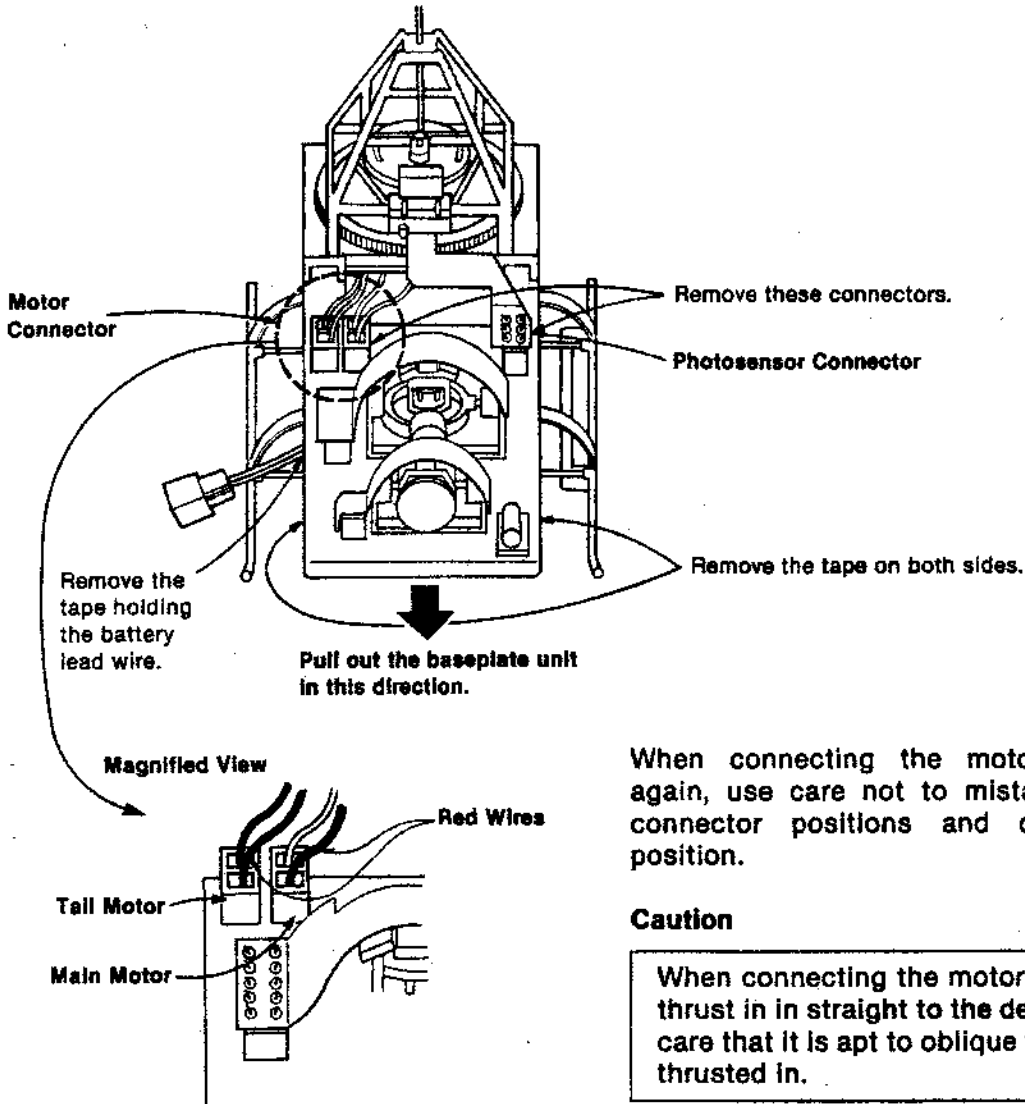
Replacement parts have to be purchased at the store where you purchased the H-610. Our company does not sell them directly to users.

### <Body>

To repair the body, use a foamed-styrene bonding agent or an epoxy type bonding agent sold on the market. The latter, which dries 5 minutes earlier, will be convenient. If the body often repaired loses balance, replace it with a new body.

### <Replacement of body, Main Gear Unit, and Tail Gear Unit>

- ① Remove the motor connector, photosensor connector, and tape. Then remove the baseplate unit. At this time, use care particularly not to cut the enameled wires of the gyros.

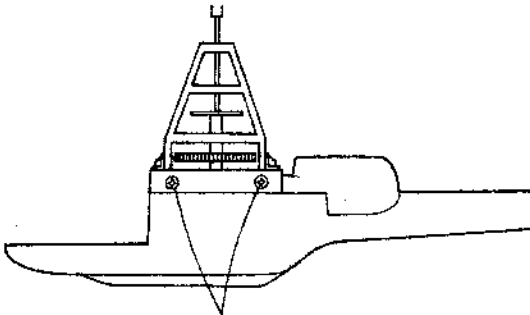


When connecting the motor connector again, use care not to mistake main/tail connector positions and colored wire position.

#### Caution

When connecting the motor connector, thrust in in straight to the depth. Take care that it is apt to oblique when being thrust in.

- ② Remove the main gear unit.



Remove these screws (right and left, total 4 screws), and lifting the main gear unit a little, remove it.

- ③ Remove the tail motor and tail gear unit, which have been taped to the body and should be removed with care.  
 ④ Mount the removed parts to the new body in reverse order of disassembly.

Cautions in reassembly:

- Since the body has no screw holes for mounting the main gear unit, first place the main gear unit in the mounting position and make holes in the body through the screw holes of the main gear unit by use of a fine drill. (Refer to the body in the before-replacement state.)
- Tail Motor  
 Mount it by use of the both-sided tape included in the accessories. The wire between the motor and gear unit should be in a straight line with the motor and gear unit shafts as viewed from above and sides, and be kept neither loose nor excessively tensioned.

The motor shaft, gear unit shaft, and wire should be in a straight line.



If the wire is loose or excessively tensioned, loosen this screw, and adjusting the wire tension moderately, tighten the screw again.

- Use care not to mistake positions of connectors to be inserted into the main motor and tail motor. (see P17)
- Insert the photosensor connector without fail.

## <Main Motor Replacement>

When the main motor decreases in driving force, it is nearing the end of its service life. Purchase a new one (option part), and replace the former with the new one. The main motor mounted with setscrews can be replaced easily.

Gears should be made to mesh leaving clearances as narrow as the thickness of a sheet of paper. The service life of the main motor is 10 hours approximately.

## <Tail Motor Replacement>

When the tail rotation becomes uncontrollable (the helicopter always turns left and does not turn right), the tail motor is nearing the end of its service life.

Purchase a new one (option part), and replace the former with the new one.

When replacing, loosen screws for parts attached to the tail motor shaft, pull out the wire, and mount the new tail motor in the way mentioned in the section of <Replacement of body etc.>.

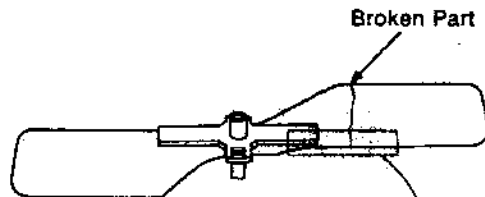
The service life of the tail motor is 10 hours approximately.

## <Rotors> (see P5)

When the main rotor is broken, replace it with a new one without fail.

Do not reuse it by repairing with a cellulose tape, etc. Once broken, it may tear again to bring about danger. Absolutely avoid reusing it.

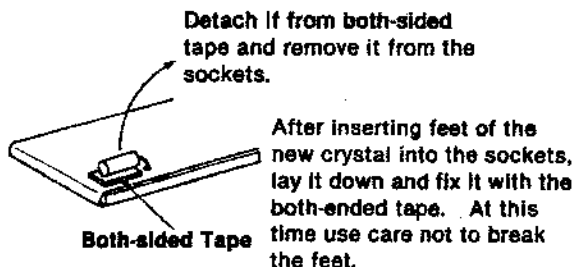
The tail rotor can be repaired with a cellulose tape.



Stick a cellulose tape on the both sides as illustrated.

## <Crystal Replacement>

The H-610 uses a specific crystal (27MHz, 1 band). When replacing it with an option crystal (other band), replace it in the way illustrated to the right. (At the same time, replace the transmitter crystal, too.)



## 12 Option Parts

### <7.2V 1200mAh~1700mAh Cable for Wired Control>

About 3 minutes of flight is possible by use of the attached cable for wired control, but, in order to make it possible for you to enjoy a longer flight, we have prepared another cable to be used for a 1200~1700mAh Ni-Cd battery for wired control.

In this case, the total duration of flight is about 20 minutes. However, after flying the H-610 for 3 minutes, disconnect the battery from the cable connector, and rest the helicopter for 3 minutes. A continuous flight over 3 minutes will deteriorate the rotors and the gyro motors heavily.

#### Caution

Bi-axial rate gyro to be used for Gyro Saucer II E-570 (another product of our company) cannot be used for REVOLUTOR H-610.

## Option Parts List

The following option parts are not sold directly by us to users. Please purchase them from your dealer or at a nearby store selling them.

Part Name	Model No.
Rotor Set (Main Rotor & Tail Rotor each 3)	OP-95457
Replacement Body (w/Decal)	OP-95454
Ni-Cd Battery (7.2V 120mAh)	OP-8952
Ni-Cd battery (7.2V 290mAh)	OP-90611
Rapid Charger (7.2V 120mAh)	OP-8950
Rapid Charger (7.2V 290mAh)	OP-90612
Cable (7.2V 290mAh) for Wired Control	OP-92736
Cable (7.2V 1200~1700mAh) for Wired Control	OP-90969
Crystal Set (27MHz 3-band)	OP-92728

Option parts include the following items to be used for repair and replacement.

Main Motor	OP-95456
Tail Motor	OP-95455
Main Gear Unit	OP-95458
Tail Gear Unit	OP-95452
Free Gyro	OP-8986
Rate Gyro	OP-8985

## **13 Troubleshooting Guide**

### **1. Main motor and gyros fail to rotate.**

- Antenna wire broken or disconnected?  
If so, replace it with a new one of the same kind (about 50cm long).
- Transmitter battery used up though transmitter lamp is on.  
Replace battery if it has been used for about total 10 hours.
- Wired-control cable fuse blown?  
If blown, replace it with a new one. Be sure to use a fuse attached as an accessory.
- Crystal used in transmitter or mounted on baseplate inside the body slipped off?  
[see P19](#)
- Transmitter mode select switch (A, B) not staying halfway?

### **2. Main rotor fails to start up.**

**(Gyro rotates.)**

[see P17](#)

- Motor connector thrust in baseplate securely?
- Photosensor connector not loose?

### **3. Main rotor is apt to stop or stops during flight.**

- Antenna wire neither broken nor disconnected?
- Transmitter battery used up though transmitter lamp is on.
- Set up transmitter antenna and operate transmitter, or remove to other place.

### **4. Helicopter rocks heavily or turns over soon.**

- Sensor plate position correct? Mount sensor plate correctly according to instructions in [5](#) Flight Procedure.  
[see P9](#)
- Connecting rod screw tightened completely?  
[see P5](#)
- Free gyro rotating? Check if free gyro connector is loose. If free gyro and rate gyro are both stationary, either one of them is wrong. Pull out connector of either one of them, disconnect battery, and about 10 seconds later, connect battery. Try this work with free gyro and then with rate gyro. Replace gyro which has been dead.

### **5. No hovering attainable since helicopter moves right, left, forward, or rearward. Or slips sideways and fails to move up.**

- Slant (skid slanting plate) raised? [see P9](#)
- Canopy not taken out? It should be mounted without fail.  
[see P5](#)
- Body made to rise to height not lower than 30cm from floor?
- No air blown against body (from airconditioner, etc.)?
- Transmitter trimmers already adjusted?  
[see P12](#)
- Wired-control cable let through skid and attachment rubber?  
(for wired control) [see P7](#)
- Ni-Cd battery not out of position?  
(for wireless control) [see P7](#)

### **6. Helicopter vibrates.**

- Propeller shaft not bent by fall shock, etc.?
- Demount main rotor, and pressing propeller shaft by fingers, unbend it little by little.  
If it is too hard to repair, purchase an option main gear unit (OP-95458) and replace former one with new one.

[see P17](#)

## Preface

Many thanks for your purchase of REVOLUTOR H-610.

REVOLUTOR H-610, in which an epoch-making electronic device to slant the main rotor (surface of revolution) against the axial direction is incorporated, is really ideal in terms of size and lightness that have hitherto been impracticable with motor-operated radio control helicopters using the conventional system. Besides, our company's creative gyrosensors (free gyro and rate gyro) adopted for its control help you operate the radio control helicopter with ease to a wonder. Vertically, forward, crosswise, and turn.....you can enjoy flying it to your heart's content. This radio control helicopter has been so designed as to permit operation by anybody, but it will be necessary for you to get used to its operation before flying it freely. Please peruse this instruction book, practice its flight with care, and then widen the range of your hobby life.

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## Complete Set

Assembled Helicopter.....	1
Transmitter .....	1
Rotor Set .....	1
Main Rotor .....	3
Tail Rotor .....	3
Wire Cable .....	1
(for 290 mAh)	
Screwdriver .....	1
Decal.....	1

### Parts to be purchased separately:

- Ni-Cd Battery (to be used for Main Body)
- Battery Charger
- U3 Dry Cell × 6 (to be used for Transmitter)