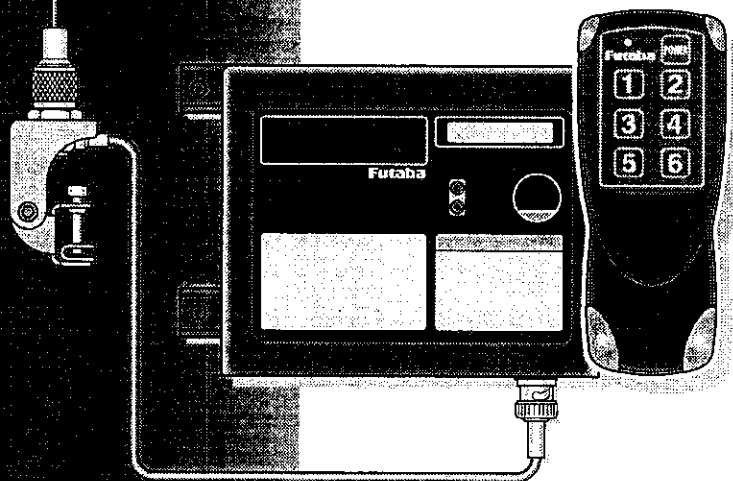


Thank you for purchasing this FRN Series radio control system.

### **⚠ Notes**


- Read this instruction manual carefully before installing or operating the radio control system.
- Operating this radio control system in anyway different from the information provided in this instruction manual may result in serious accident.
- Keep this instruction manual nearby the radio control system so that users can readily refer to it if necessary.
- Whenever alienating this radio control system, provide the new owner with this instruction manual along with the actual radio control system.
- This radio control system was manufactured in accordance with the laws and regulations of Japan. Use it only in Japan.



**\* Provide this instruction manual to the end-user along with the actual radio control system.**



## Precautions for Users

- 1 Before using this radio control system, read this instruction manual carefully. Instructions and warnings (marked with a ) with regard to installation, handling and operation are particularly important towards safety. Carefully read this manual and familiarize yourself with the information it contains.  
This manual has been prepared with utmost care, however if you come across anything you do not understand or incorrect, contact Futaba.
- 2 This instruction manual explains how to install, operate and troubleshoot with the radio control system.
- 3 The content of this instruction manual is subject to change without notice because of product improvements and specification changes.
- 4 It is strictly prohibited by pertinent copyright laws to copy, print or electronically transfer any part of the instruction manual without the expressed written consent of Futaba Corporation.
- 5 Do not remodel the radio control system. Futaba cannot predict functioning and dangers in the event of unauthorized remodeling, and therefore cannot guarantee safety in use.  
If you require modifications for special uses, contact Futaba.
- 6 Use of consumables and parts (including electrical parts) not specified by Futaba may cause malfunctions and unforeseen accident. Use only Futaba-specified consumables and spare parts.
- 7 Failure to heed operating instructions and warnings contained in this instruction manual or use of this radio control system in excess of specifications or installation conditions may result in personal injury and property damage. Never perform any act contrary to instructions and warnings provided in this manual.
- 8 Attach your warranty slip to the radio control system when requesting servicing. Futaba does not provide warranted servicing without verifying the actual warranty slip.  
For more information on warranty conditions, see your warranty slip.
- 9 Whenever selling or otherwise alienating this radio control system, provide the new owner with all accessories and this instruction manual along with the actual radio control system.
- 10 Before exporting the devices of this radio control system outside of Japan, complete all required formalities for export trade.  
This radio control system does not qualify as a strategic device, however if contained devices do, you must first obtain a permit from the Ministry of Economy, Industry and Trade.  
You may also be prohibited from importing the radio control system to certain areas because of local radio laws.
- 11 Do not use this radio control system as or for weapons of any kind.
- 12 Entrust disposal of this radio control system to an authorized industrial waste handler.  
Do not dispose of it in any way in violation of pertinent laws including but not limited to illegal dumping. Also, do not leave this radio control system anywhere ordinary persons (children included) can easily touch it.


# Safety Precautions

Before use, read these Safety Precautions carefully. Use this radio control system in strict observance of these precautions.

.....

## Explanation of Warning Indications

This instruction manual uses the below symbols to prevent unexpected accidents due to improper handling.

 <b>CAUTION</b>	These items contain information that, if ignored, can result in personal injury and property damage.
--	--

<b>NOTE</b>	These items contain notes or restrictions on usage. Read them so as not to operate the radio control system incorrectly.
-------------	--

## SAFETY PRECAUTIONS

### CAUTION

Take all necessary safety measures with equipment that incorporates this radio control system. If the distance between the transmitter and receiver exceeds the range of the radio control system's radio waves or if equipment becomes inoperable because of excessive noise or other reason, receiver output will open. Keep this in mind at all times when using the radio control system. Any equipment connected to this radio control system must be within the specification range of the radio control system. Wire equipment correctly and observe all pertinent precautions in this instruction manual during use. Futaba assumes no responsibility whatsoever for accidents or property damage resulting from wiring or use outside of the specification ranges of this radio control system.

#### **Transmitter**

- Use only the specified batteries.
- Do not mix old batteries with new batteries or batteries of different type. Always use new batteries of the same type.
- Do not recharge dry storage batteries.  
A ruptured battery casing and leaking electrolyte may result in fire, personal injury and localized contamination.

#### **Receiver**

- Do not install in the vicinity of combustible gases.  
Contact with combustible gases may result in fire.
- Do not leave in humid places or where possibly contacted by water.  
Water penetrating inside the receiver may result in malfunction and damage.
- Shut power to equipment OFF before making wiring connections.  
Working with the power ON may result in electric shock.
- Check this instruction manual and wiring diagrams of equipment you plan to connect to this radio control system before wiring equipment.  
Improper wiring and poor connections may result in malfunction, damage and accident.

#### **Operation**

- Check the transmitter is not being operated before activating power to the receiver.  
Starting up the receiver while the transmitter is ON may result in accident as equipment controlled by the radio control system may move unexpectedly.
- Check the area around equipment controlled by the radio control system is safe before activating power.  
Careless operation may result in personal injury and property damage.

**NOTE****Transmitter**

- **The transmitter is of waterproof construction, however do not allow water to penetrate the casing or submerge the transmitter in water.**  
Internal contact with water may result in malfunction and damage.
- **The transmitter is a precision device, therefore do drop it or subject it to strong impacts or vibrations.**  
Rough handling may result in malfunction and damage.
- **Do not cover or insert objects into the vent on the rear side of the transmitter.**  
Covering the vent with stickers or other objects may cause the casing to deform and consequently break the waterproof seal. Also, puncturing the special film inside the vent will break the waterproof seal.
- **The casing is made of resin, therefore contact with solvents such as alcohol, thinner and gasoline may dissolve and crack the casing.**
- **Observe the following when storing the transmitter.**
  - If not planning to use the transmitter for a long period of time, remove the batteries.
  - Do not leave the transmitter where exposed to direct sunlight.
  - Do not store the transmitter where possibly contacted by water or exposed to temperatures or humidity outside of specification ranges.

**Receiver**

- **Use the receiver only in suitable environments and observe all precautions given in “4. Attaching the Antenna to the Receiver” on pg. 13 ~ 17.**
- **The receiver is a precision device, therefore do drop it or subject it to strong impacts or vibrations.**
- **Do not bend the antenna or apply excessive force to it.**  
Abusive handling may result in malfunction and damage.
- **The casing is made of resin, therefore contact with solvents such as alcohol, thinner and gasoline may dissolve and crack the casing.**
- **Observe the following when storing the receiver.**
  - Do not install the receiver where exposed to direct sunlight.
  - Do not store the receiver where possibly contacted by water or exposed to temperatures or humidity outside of specification ranges.

## Product Features

### ■ No license required

The transmitter uses low frequency radio waves, therefore you do not have to apply for a permit to use the product after purchase.

### ■ Highly safe design

With 65,536 unique ID codes available, there is no need to worry about crosstalk or misoperation. Using our own original correlated decoding system, noise becomes strong outside of a 30 m radius. (This distance may be shorter depending on the radio wave environment in the surrounding area.)

### ■ General-use waterproof construction transmitter

The transmitter is of general-use waterproof construction, therefore it operates even in the rain. The equipment can be used a wide variety of environments.

### ■ Power-saving features

Transmitter battery consumption is minimized when switches are not operated by a periodic operation feature, standby mode and automatic power off feature.

- The FRN604T010 does not come with the automatic power off feature.

### ■ Built for safety

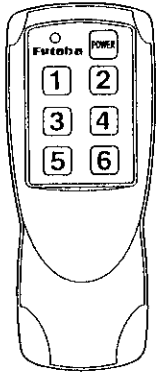
The radio controls system comes with a host of features to assure proper operation and prevent accidents including a power on failsafe that prevents unexpected operation when the transmitter's power is activated, clip type transmitter switches that enable the user to sense switch operating positions and a 2-color indicator lamp that notifies the user of transmitter status and when batteries run out.

# CONTENTS

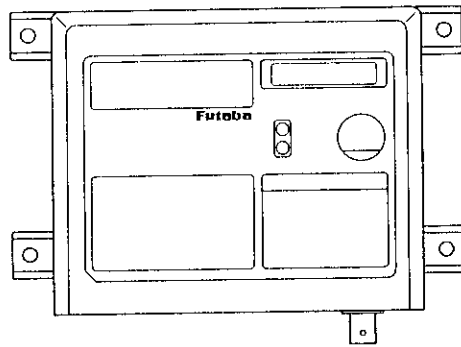
<b>Introduction</b>	<b>Safety Precautions</b> .....	<b>1</b>	Package Contents	
	<b>Product Features</b> .....	<b>4</b>		Names of Parts
	<b>1. Package Contents</b> .....	<b>6</b>		
	1-1. Set Code, Transmitter and Receiver Model Codes .....	7		
1-2. How to Order a Transmitter .....	7	Loading/Replacing Transmitter Batteries		
<b>2. Names of Parts</b> .....	<b>8</b>			
<b>Transmitter</b>	2-1. Transmitter .....	8	Attaching the Antenna to the Receiver	
	2-2. Receiver .....	9		
<b>Receiver</b>	<b>3. Loading/Replacing Transmitter Batteries</b> .....	<b>10</b>	Wiring the Receiver	
	3-1. Procedure .....	10		
	<b>4. Attaching the Antenna to the Receiver</b> .....	<b>13</b>		
	4-1. Receiver Installation Location .....	13	Operation	
	4-2. Receiver Installation .....	14		
	4-3. Reception Antenna Installation .....	15	How to Use the Transparent Sheet for Transmitter	
	<b>5. Wiring the Receiver</b> .....	<b>18</b>		
	5-1. Wiring Conditions .....	19		
	5-2. Wiring to Connector Pins .....	20		
	5-3. Inserting Connector Pins into the Connector Housing .....	21		
5-4. Receiver I/O Connector Map .....	21	Troubleshooting		
5-5. Correspondence between Transmitter Switch and Receiver Channel Output .....	22			
<b>Radio Control</b>	<b>6. Operation</b> .....	<b>23</b>	Product Specifications	
	6-1. Precautions in Operation .....	23		
<b>Troubleshooting</b>	6-2. Operating Procedure .....	24	Servicing	
	<b>7. How to Use the Transparent Sheet for Transmitter</b> .....	<b>27</b>		
	<b>8. Troubleshooting</b> .....	<b>29</b>	11	
	8-1. The connected equipment does not respond to transmitter operating switches. ....	29		
	8-2. Operation is unstable. ....	30		
	<b>9. Product Specifications</b> .....	<b>31</b>		
	9-1. Transmitter/Receiver Common Specifications .....	31		
	9-2. Transmitter Specifications .....	32		
	9-3. Receiver Specifications .....	33		
	<b>10. Servicing</b> .....	<b>35</b>		

# 1. Package Contents

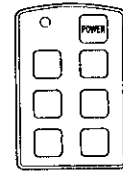
After purchasing the product, open the package and check all of the below items are included. If anything is missing, contact the place of purchase or Futaba. (See the back cover for Futaba locations.)



Transmitter x 1



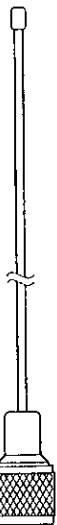
Receiver x 1



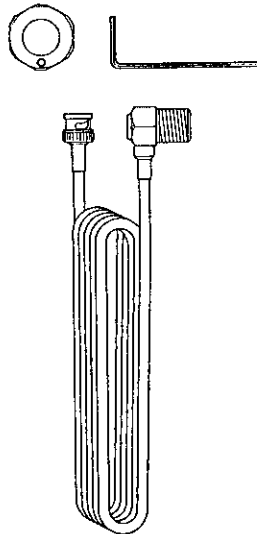
Transparent sheet for transmitter x 1



Strap for transmitter x 1

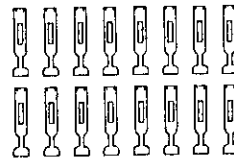


Reception antenna (L260 mm) x 1

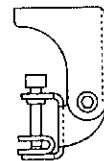


Reception antenna cable (L4 m) x 1

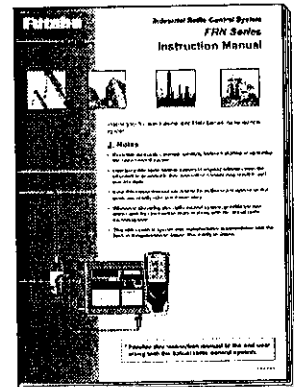
Round nut x 1  
Hex key for round nut locking screw x 1



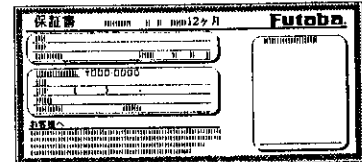
I/O connector housing x 1  
Connector pins x 16 (Packaged)



Reception antenna mount x 1



Instruction Manual x 1  
(This manual)



Warranty slip x 1

For model codes of the transmitter and receiver, see "1-1. Set Code, Transmitter and Receiver Model Codes" on the next page.



## 1-1. Set Code, Transmitter and Receiver Model Codes

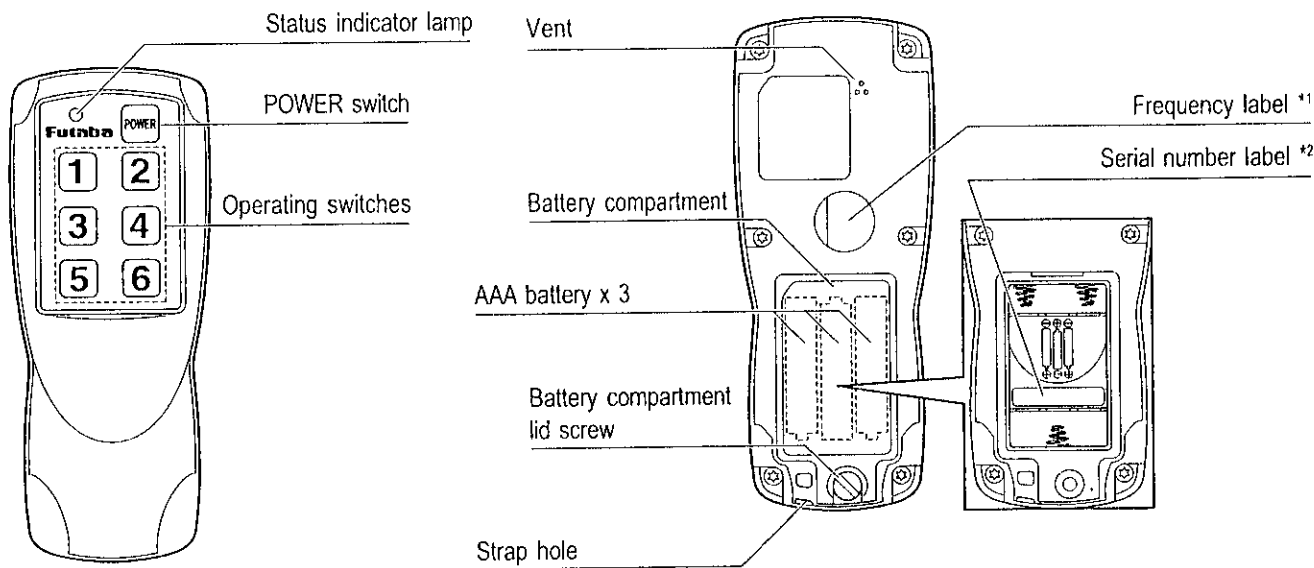
Set code	Number of channels	Receiver output	Transmitter model code	Receiver model code
00202548	2 ch	+ power supply voltage output	FRN201T040	FRN201R060
00202547		Independent relay contact output		FRN202R070
00202546	4 ch	+ power supply voltage output	FRN401T030	FRN401R040
00202545		Independent relay contact output		FRN402R050
00202543	6 ch	+ power supply voltage output	FRN601T010	FRN601R010
00202542		Independent relay contact output		FRN602R020
00202544	6 ch	Independent relay contact output	FRN604T010	FRN602R020

## 1-2. How to Order a Transmitter

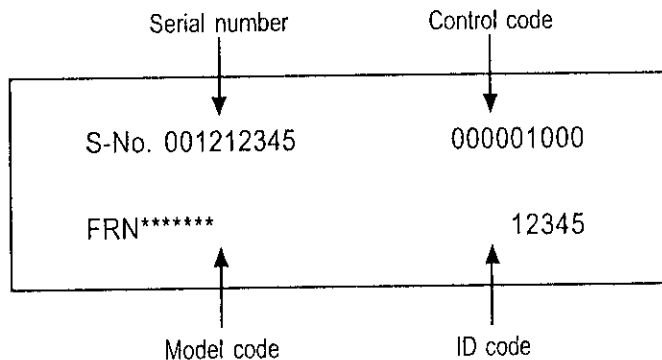
- If you need a new transmitter because your previous one broke or was lost, inform Futaba of the serial number of the previous transmitter when ordering a new one. The serial number is found on the warranty slip.
- For the location of the serial number label, see “2-1. Transmitter” on pg. 8.
- Also, when ordering a transmitter, inform Futaba of the set code and transmitter model code. This information is available in “1-1. Set Code, Transmitter and Receiver Model Codes”.

## 2. Names of Parts

### 2-1. Transmitter



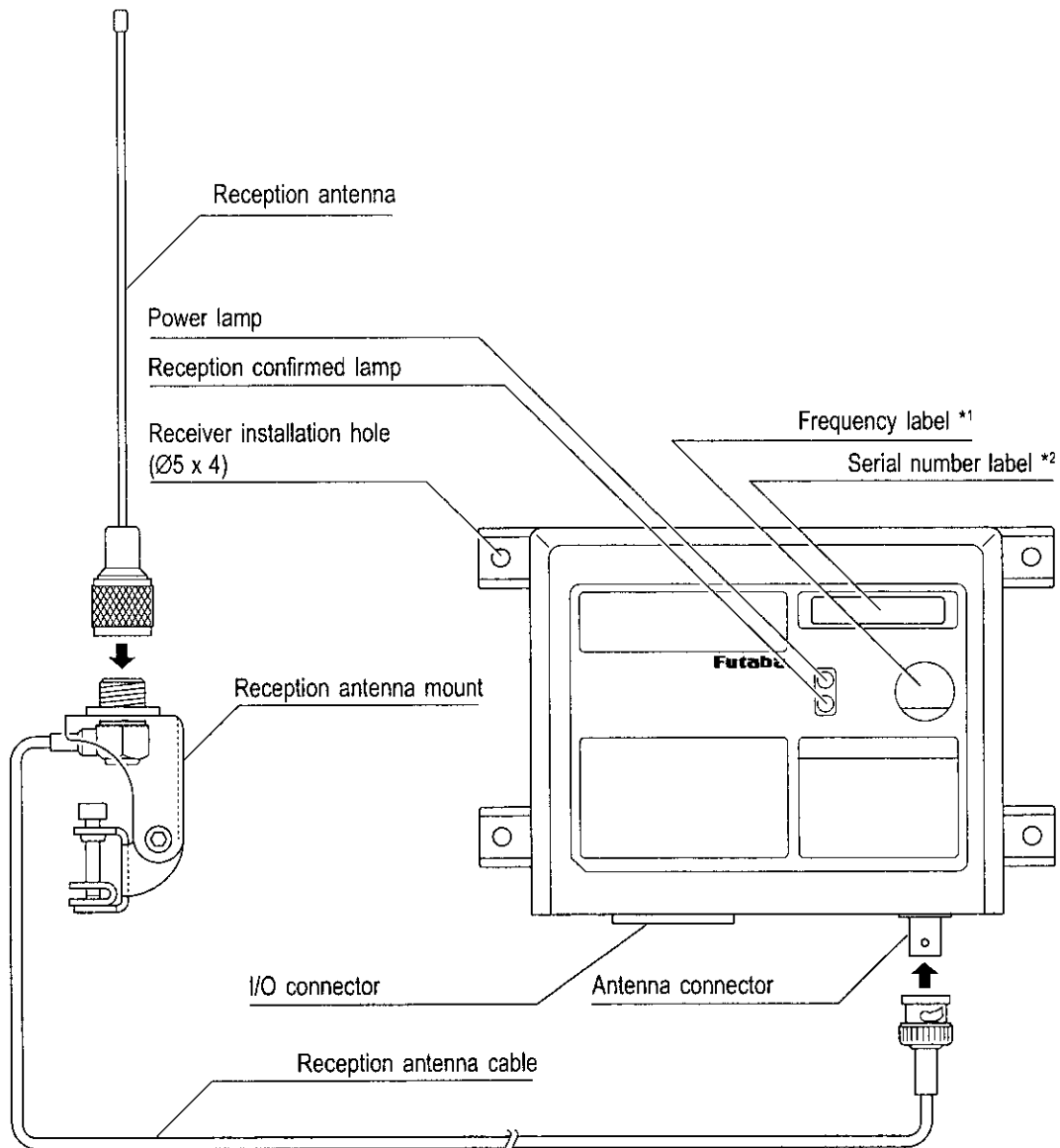
#### Serial Number Label



\*1 and 2

Transmitters and receivers of differing ID codes or frequency label numbers cannot be used together. If the codes do not match, contact Futaba.

## 2-2. Receiver



\*1 and 2

Transmitters and receivers of differing ID codes or frequency label numbers cannot be used together. If the codes do not match, contact Futaba.

### 3. Loading/Replacing Transmitter Batteries

The transmitter runs on three AAA dry cell batteries.

Prepare these batteries in advance.

- \* Use of manganese or nickel-cadmium batteries is not recommended for practical reasons as these batteries tend to run down quickly and the transmitter stops working immediately after the battery low indication.

If the batteries get low, the status indicator lamp flashes red during use. When the AAA alkaline dry cell batteries are used, from the moment the lamp starts flashing red, the transmitter can be used for about 1 hour, but battery power is low and you should load fresh AAA batteries as soon as possible.



#### CAUTION

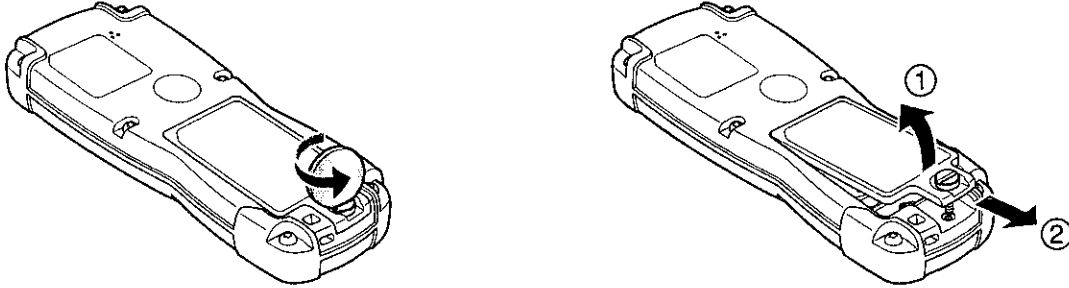
- Use only the specified batteries.
- Do not mix old batteries with new batteries or batteries of different type. Always use new batteries of the same type.
- Do not recharge dry storage batteries.
  - \* A ruptured battery casing and leaking electrolyte may result in fire, personal injury and localized contamination.

#### NOTE

- When replacing the batteries, keep foreign objects and especially metal out of the transmitter. Contact with foreign objects may result in damage.
- If not planning to use the transmitter for a long period of time, remove the batteries. Leaving the batteries in the transmitter may result in electrolyte leaks and damage.

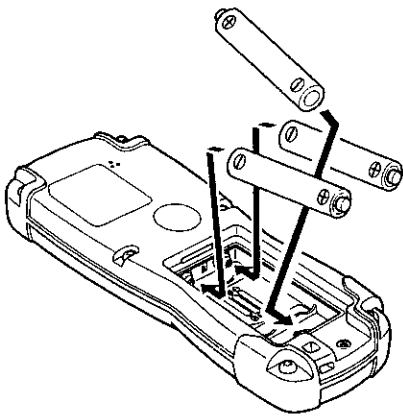
### 3-1. Procedure

- 1 Loosen the battery compartment lid on the transmitter rear with a coin or screwdriver and then lift and slide the lid as shown in the figure to detach it.

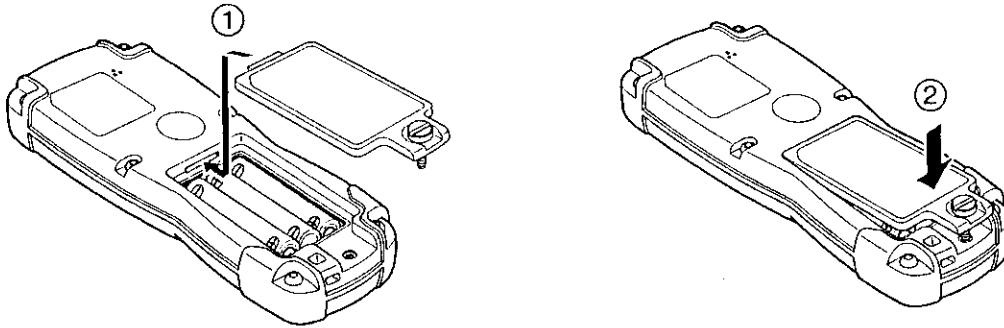


- 2 Load the dry cell batteries in the direction indicated by the (+, -) polarity labels inside the battery compartment.

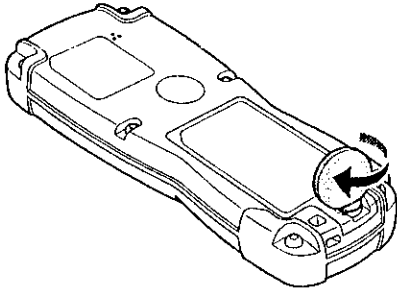
\* Load the side batteries first and the center battery last.



- 3 Slide the battery compartment lid back into place and insert the projecting tab into the groove of the transmitter body.



- 4 Securely tighten the battery compartment screw with a coin or screwdriver.  
\* Close the battery compartment securely and tighten the battery compartment lid screw securely.  
If loose, water may penetrate inside the transmitter whereby resulting in damage.



## 4. Attaching the Antenna to the Receiver

### 4-1. Receiver Installation Location

#### ⚠ CAUTION

- ❑ Do not install the receiver in the vicinity of combustible gases.  
\* Installing the receiver in such a place may cause an explosion.

#### NOTE

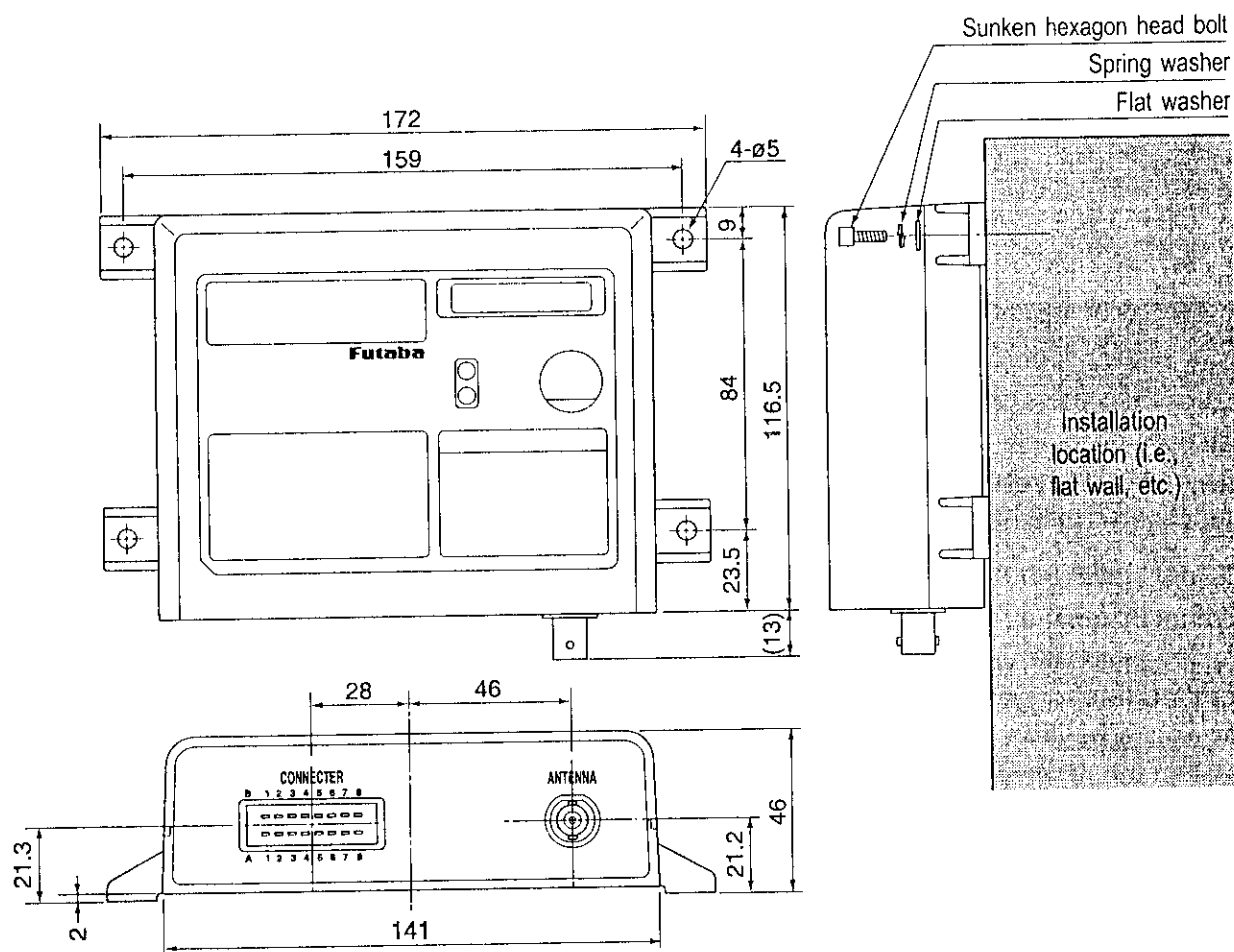
Install the receiver in a location that meets the following conditions. Installation in an inadequate place not only prevents the receiver from exhibiting its full performance but can also result in malfunction and damage.

- ❑ Do not install the receiver in highly humid places or where possibly contacted by water.
- ❑ Do not install the receiver where exposed to direct sunlight.
- ❑ Do not install the receiver where exposed to extremely high or low temperatures. (Working temperature range: -20 ~ +60 °C, Working humidity range: 90%RH and below, no dewing)
- ❑ When the receiver is installed on a vibrating machine, be sure to make vibration abatement to protect the receiver from the vibration of the machine.
- ❑ Install the receiver on a flat surface (i.e., wall, etc.). If forced onto a curved wall, the casing may deform resulting in malfunction and damage.
- ❑ When the receiver is installed perpendicular to a wall, face the connector surface downward so as to prevent foreign matter and dust from building up on connectors.

## 4-2. Receiver Installation

The receiver has four  $\varnothing 5$  installation holes. Install it with proper size bolts and washers. However, keep tightening torque to 2.5 N/m (25 kgf/cm) and below.

### [Installation Example]





### 4-3. Reception Antenna Installation

#### CAUTION

- Before electrically welding the antenna's metal plate to a metal surface, detach the antenna from the receiver.

\* The high current of welding will damage receiver circuits.

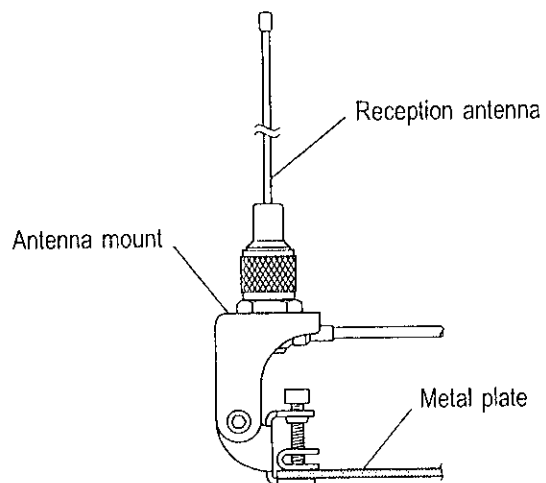
Attaching the Antenna to the Receiver

4

#### NOTE

- Use the included antenna cable. Install the antenna in a position higher than ground level and away from sources of electrical noise (i.e., motors, computers, etc.).
- Anchor the antenna on a metal surface of large area (of large gland effect). The smaller the area, the shorter the reception range. Select a metallic surface that is 300 x 300 mm in area or larger.
- Before anchoring the antenna cable connector directly on metal or anchoring the included antenna mount on metal, remove all paint and insulation from the metal surface so that the contact point is electrically continuous.
- Installing the reception antenna near to objects and especially metallic objects shortens reception distance and causes strong directivity. Install the antenna as far away from objects as possible.
- If the threaded part of the antenna element is loose or completely disconnected, reception range shortens. Install the antenna element securely.
- Sharply or repeatedly bending the antenna may cause disconnection. Handle the antenna with care.
- Connect the BNC connector of the antenna cable securely to the BNC connector of the receiver.

## Example: Using the Antenna Mount



## Example: Directly Connecting the Reception Antenna to a Metal Plate

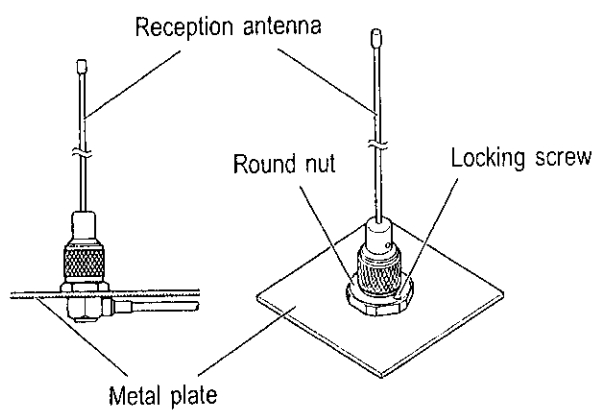
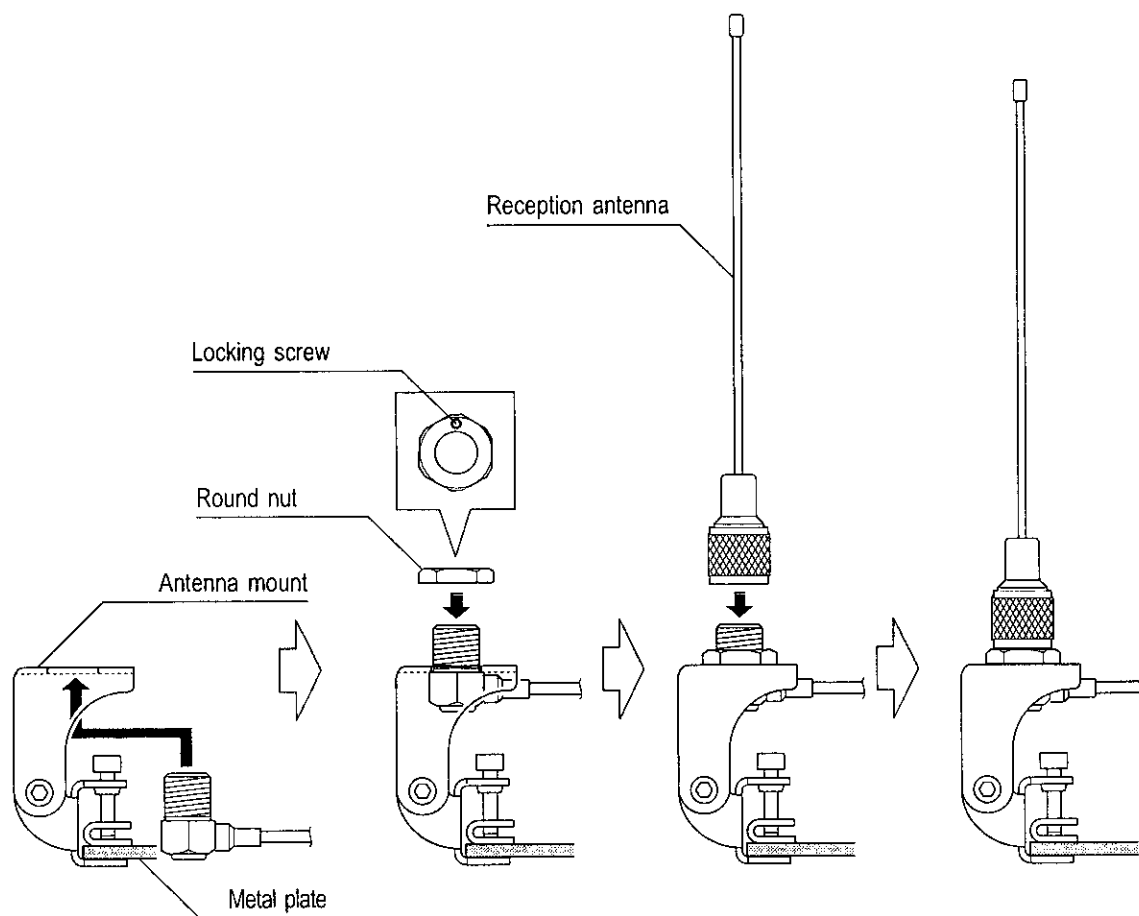


Plate thickness: 5 mm or less  
Installation hole diameter:  $\varnothing 16.2$  mm

□ How to attach the Reception Antenna



Attaching the Antenna to the Receiver

4

To attach the reception antenna directly to a metal plate, use a metal plate as a substitute of the antenna mount shown above. For the direct installation, prepare a metal plate that is 5 mm or less in thickness and has an installation hole that is  $\text{Ø}16.2$  mm in diameter.

\* To attach the antenna cable connector to a metal and the antenna mount, first tighten the round nut tightly and then tighten the round nut's locking screw with the included hex key.

## 5. Wiring the Receiver

### CAUTION

- Shut power to equipment OFF before wiring to the receiver.
  - \* Working with the power ON may result in electric shock and other accidents.
- Check this instruction manual and wiring diagrams of equipment you plan to connect to this radio control system before wiring equipment.
  - \* Improper wiring and poor connections may result in malfunction, damage and accident.

### NOTE

- FRN Series receivers come in "+ power supply voltage output" and "independent relay contact output" types. For the output type of your receiver, see "1-1. Set Code, Transmitter and Receiver Model Codes" on pg. 7.
- Be careful not to get (+, -) polarity of the input power supply backwards.

## 5-1. Wiring Conditions

- ☐ Operating power supply voltage: 9 ~ 31 V DC
- ☐ Max. control capacity

	+ power supply voltage output		Independent relay contact output	
Max. control capacity	Resistance load	5 A	Resistance load	120 V AC, 5 A
	Inductive load (L/R = 7 mS)	2 A		31 V DC, 5 A
	* Total current on all channels 8 A		Inductive load (cos $\phi$ = 0.4) (L/R = 7 mS)	120 V AC, 2 A 31 V DC, 2 A

- ☐ To use an inductive load, install a surge absorber (diode, etc.) parallel to the load as close to the load as possible.
  - \* Without a surge absorber, the service-life of the relay will shorten because of the high back-voltage generated by relay contact opening and closing. Also, the noise generated in this situation may shorten reception range.

### Inductive Load Connection Example

This examples show a DC control setup with a diode as the surge absorber.  
The diode used here has a withstand voltage that is 10 times or more the load input voltage and forward current is equal to or greater than the load current.

