

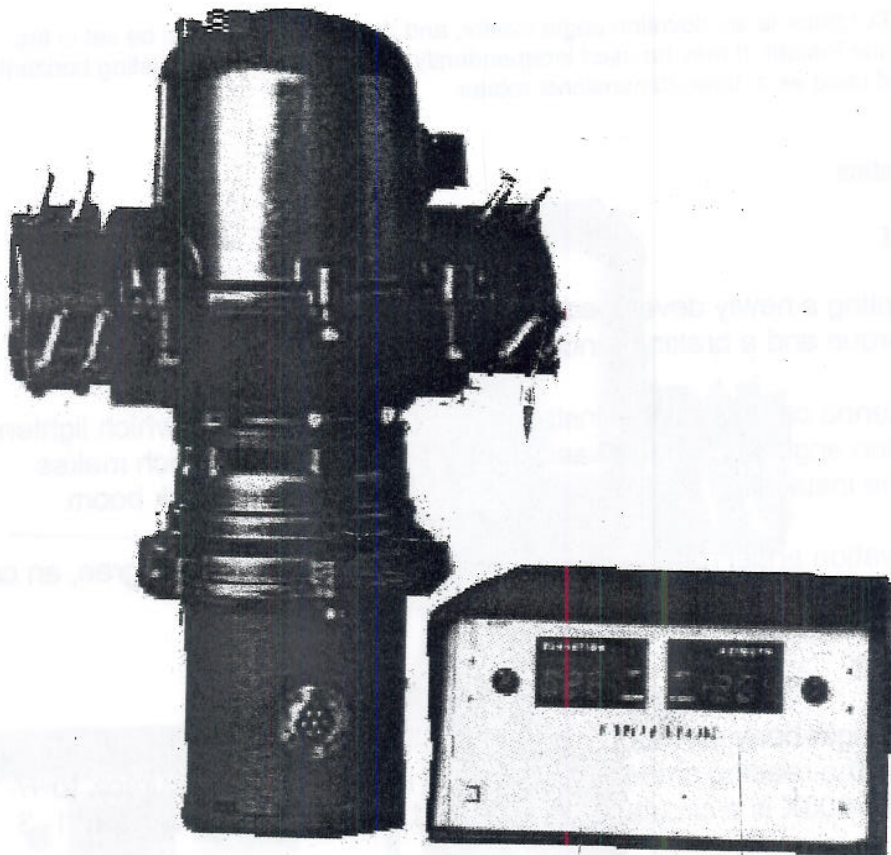
**BOGER**

**EMOTATOR®**

**EV-800DX/EV-800D7X** Single body elevation angle horizontal EMOTATOR

**EV-800X** Elevation angle EMOTATOR

## INSTRUCTION MANUAL



**BOGER**  
ELECTRONICS

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Thank you very much for choosing the EMOTATOR EV-800DX/EV-800X.

This machine is a single body elevation angle-horizontal rotator, which EMOTATOR has newly developed as the result of technology based on years of study and improvement, and is a top quality rotator not seen elsewhere.

The EV-800DX rotator can set the antenna etc., three-dimensionally in the desired direction. It can also be used for ham radio satellite communication, and can be widely used in other ways as a three dimensional rotator.

The EV-800X rotator is an elevation angle rotator, and the antenne etc. can be set in the direction of the Y-shaft. It may be used independently, or combined with existing horizontal rotators, and used as a three-dimensional rotator.

## Characteristics

### 1. Rotator

a. By adopting a newly developed rolling mechanism, this has a powerful rotation torque and a braking function.

b. The antenna can be reliably installed due to a novel design which lightens the elevation angle component, and due to a double clamp which makes possible the installation of a maximum 61mm large caliber stack boom.

c. The elevation angle rotator suppresses backlash to within 1 degree, and can maintain a constant direction for a parabolic antenna etc. *max. Ø del tubo*

### 2. Controller

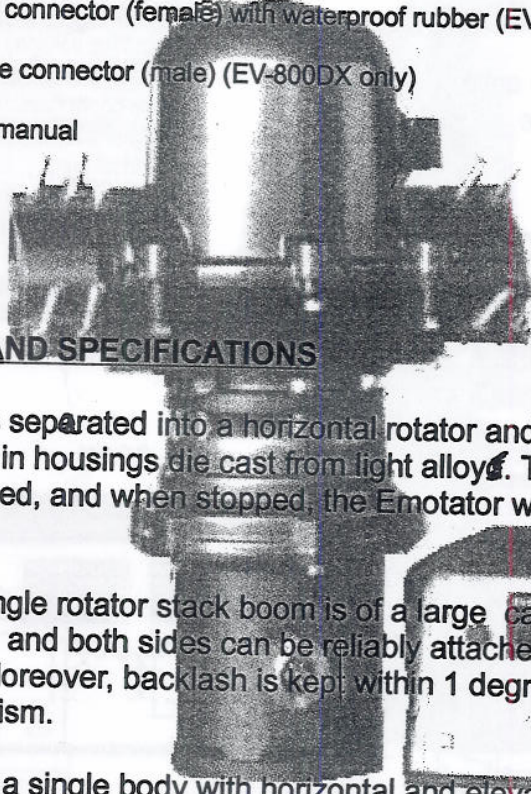
a. This is a single-body elevation angle-horizontal controller with a digital display, and the reading of the display has a high degree of accuracy, to +/- 1 degree. ( EV-800X is a circular controller, and the accuracy level is +/- 1-3 degree).

b. It is possible to set the controller in the desired direction to +/- 1 degree of error with the digital angle display, making the direction setting of parabolic antenna easy.

c. A remote terminal is provided to make control by computer, etc. possible from outside.

### CONTENTS OF PACKAGE

- 1 pce Rotator main body (EV-800X has an elevation angle component only)
- 1 pce Controller
- 1 pce Installation azimuth fine adjustment ring (for attaching bolts to the bottom of the main body.
- 6 pce 8x35bolts with nut and spring washer (for the installation of the main body)
- 1 pce Waterproof case for attaching cable ( for the elevation angle)
- 1 pce 6-pin square connector (female)
- 1 pce 6-pin square connector (male)
- 1 pce 7-pin metal connector (female) with waterproof rubber (EV-800DX only)
- 1 pce 8-pin square connector (male) (EV-800DX only)
- 1 pce Instruction manual



### MECHANISM AND SPECIFICATIONS

The Emotator is separated into a horizontal rotator and an elevation angle rotator. Both are stored in housings die cast from light alloys. The braking equipment is specially designed, and when stopped, the Emotator will not move due to wind pressure, etc.

The elevation angle rotator stack boom is of a large caliber piercing style, with a 61mm diameter, and both sides can be reliably attached to the rotating part with a double U bolt. Moreover, backlash is kept within 1 degree by a newly designed running mechanism.

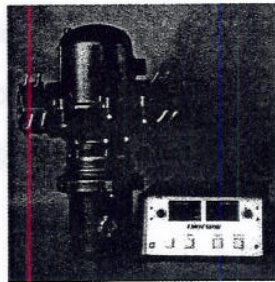
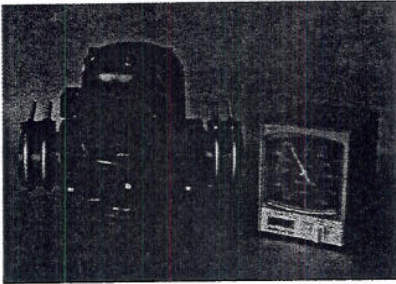
The controller is a single body with horizontal and elevation angle functions, and the display is an easy-to-read digital display. The antenna can be set in the desired direction with an accuracy level of +/-1 degree by the digital angle display. Also it has a remote control connection terminal for speed control and computer control. ( the EV-800X has a circular controller).



**SPECIFICATION TABLE**

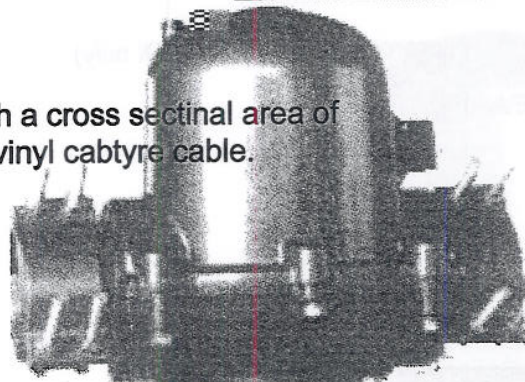
**EV-800**

**EV-800DX**

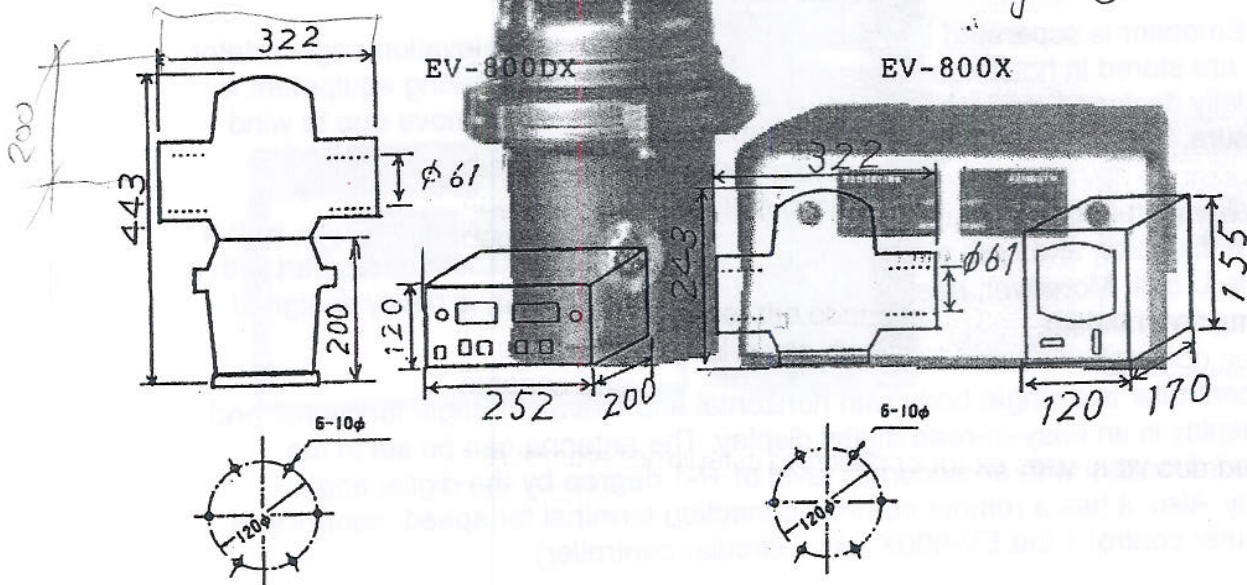


GD <sup>2</sup> max.	500/700 kgm <sup>2</sup> E/H
Braking Torque	20,000kg/cm-12,000kg/cm E/H.
Rotation Torque	1,500kg/cm/1,300kg/cm E/H
Allowable wind surface area	2m <sup>2</sup> / 1.5m <sup>2</sup> E/H
Rotation time	E 180°/64sec H 360°/86sec
Rotation angle	E 180°+10° H 360° + 10°
Rotarion angle display	E digital/circular (EV-800DX)/EV-800X) H digital (+/- 1° of error)
Connecting cable	5/5-conductor (0.5 mm <sup>2</sup> )
Operating voltage	24 V DC ⚡
Vertical mast diam.	61mm E+H
Stack boom diam.	E 61mm max.
Weight	EV-800X 6kg H 5 kg
Electrical Input	E/H AC 115V/AC220V/AC240V 50Hz/60Hz 40 VA
Remote	✓
Changes are possible every time	

Use a core wire with a cross sectional area of 0.5mm<sup>2</sup> or greater vinyl cabytre cable.



*150 kg. capacity.*

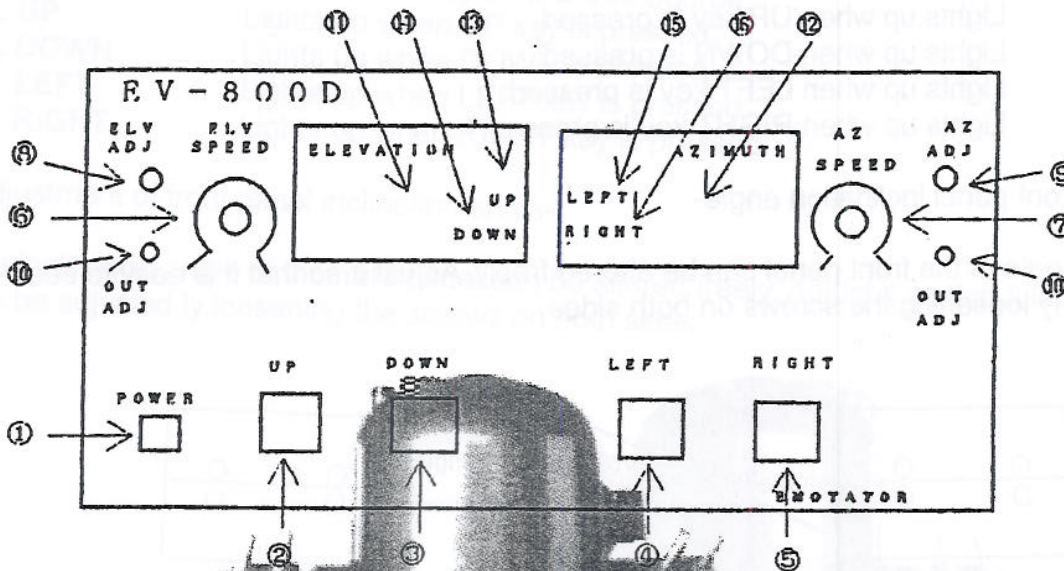


*φ<sub>Tube</sub> = 60 mm*

### EXPLANATION OF OPERATIONS FOR EACH PART

#### 1. EV-800DX

-FRONT PANEL-



#### Controls-

1. **Power** Switches power source on and off
2. **UP** Key to raise elevation angle component
3. **DOWN** Key to lower elevation angle component.  
Operates while key is depressed. ( $180^\circ - 90^\circ - 0^\circ$ )
4. **LEFT** Key to rotate horizontal component counterclockwise.  
Operate while key is depressed.
5. **RIGHT** Key to rotate horizontal component clockwise.  
Operates while key is depressed
6. **ELV SPEED** Control to adjust speed of elevation angle component.  
Speeds up when control is turned to HI, and slows down when control is turned to LOW.
7. **AZ SPEED** Control to adjust speed of horizontal component.  
Speed up when control is turned to HI, and slows down when control is turned to LOW.
8. **ELV ADJ** Control to adjust display angle for elevation angle component.
9. **AZ ADJ** Used when adjusting rotator angle and display angle
10. **OUT ADJ** Control to adjust display angle for horizontal component.  
Used when adjusting rotator angle and display angle.
11. **OUT ADJ** Control to adjust external output level of ELV AZ angle voltage.  
Used when controlling computer from remote terminal.

#### DISPLAY-

11. **ELEVATION** Digitally displays the angle of elevation angle component.

### Installation of EV-800DX

Installation of EV-800DX may be done according to any of the following three methods.

1. When attaching the horizontal component and the elevation angle component of EV-800DX as one unit to the upper part of a tower, etc., make sure that the N marking (after the SN) on the pedestal of the elevation angle component is facing due North (magnetic North). (The horizontal component connector is due South). At installation, fine tuning is done with the attached installation azimuth fine tuning ring. See Fig. 1

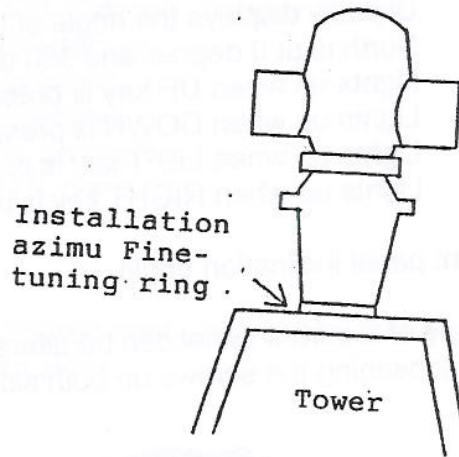


Figure 1.

2. Separate the EV-800DX elevation angle and horizontal component, and install the horizontal component in the middle section of the tower.

Attach bearing to the upper part of the tower. Using a mast clamp (EV-1217 option) on the top of the rotation mast, install the elevation angle component. See Fig. 2

Elevation angle component

3. It is possible to install the elevation angle component partway up the rotation mast using clamp metal fittings (EV-1213, option), but this disrupts the weight balance we cannot recommend it. See Fig. 3

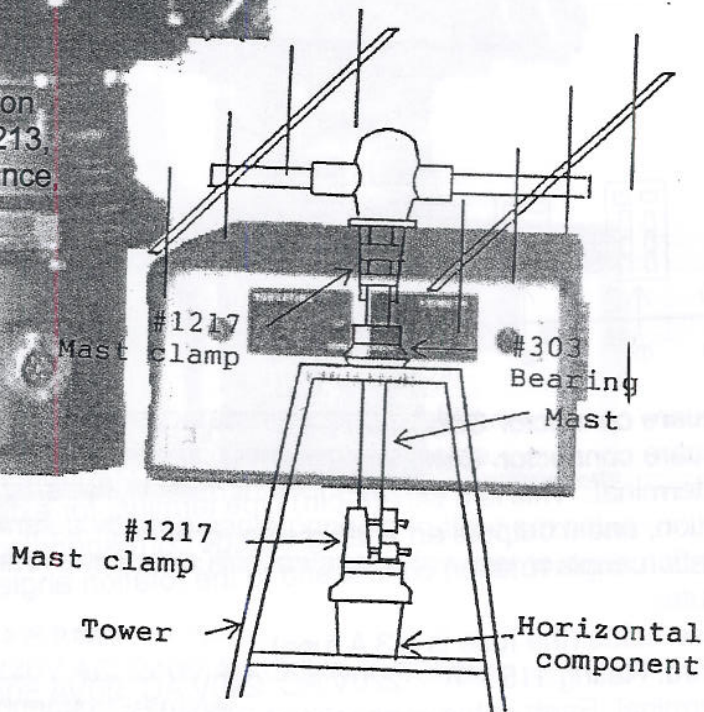
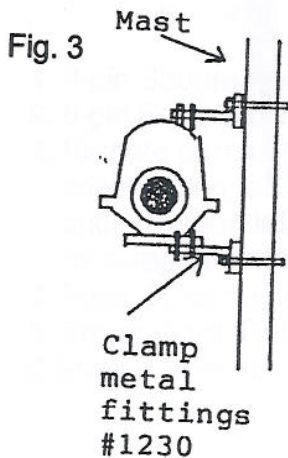


Figure 2.



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### -Caution when installing antenna, etc., on elevation angle component-

The raising and lowering of the elevation angle component is unlike the horizontal component in that the weight of the antenna directly influences the force of rotation. Therefore pay attention to the following points working with the antenna.

\*\*\*Achieving the proper balance\*\*\*

**L 1 - Distance from center of rotation to center of gravity of antenna (cm)**

**W = Weight of antenna (kgs)**

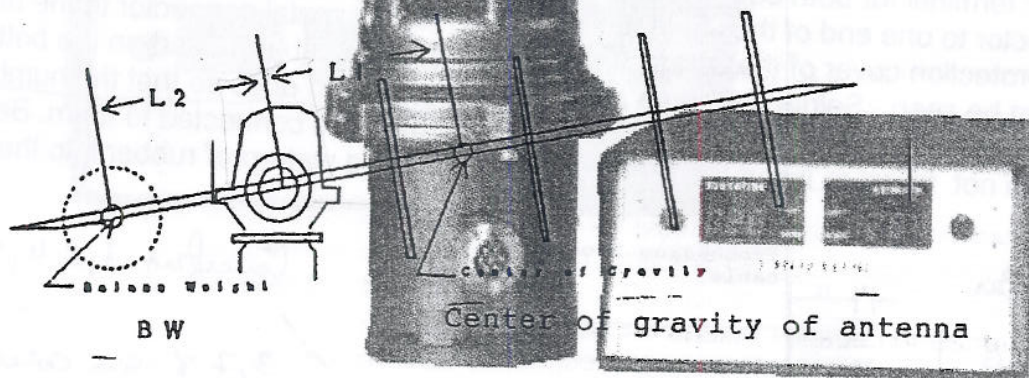
**M = Rotation moment ( kg.cm)**

Calculate that  $M = L1 \times W$ , and if M is greater then 1200 install a balance weight on the oposite side. The balance weight is calculated as follows

$$BW = M/L2$$

However, L 2 is the distance (cm) from the rotation center to the balance weight. When the center of gravity of the antenna is unknown, suspend the whole antenna with string.

The center of gravity is at the point where the antenna is equally balanced on either side. Incidentally, in the case of general ham radio, there is not a problem 20% to 30% error in balance weight.

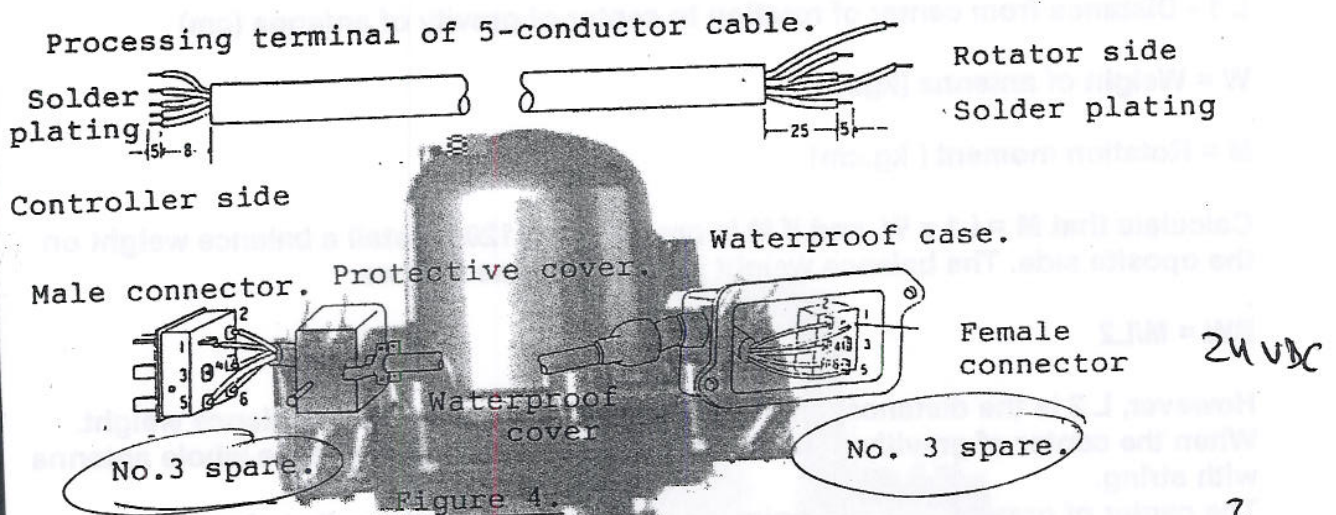


### MAKING THE CONNECTION CABLE

Use two 5-conductor cables, one each for elevation angle component and the horizontal component, for the cable to connect the rotator and the controller. Use a core wire with a cross section area of  $0.5\text{mm}^2$  or greater. Install the attached connectors to both ends of the cable by soldering, as explained below. Furthermore, use a good quality solder with high quality resined thread designed for electrical equipment.

### \*\*Elevation angel component cable\*\* (EV-800DX/EV-800X)

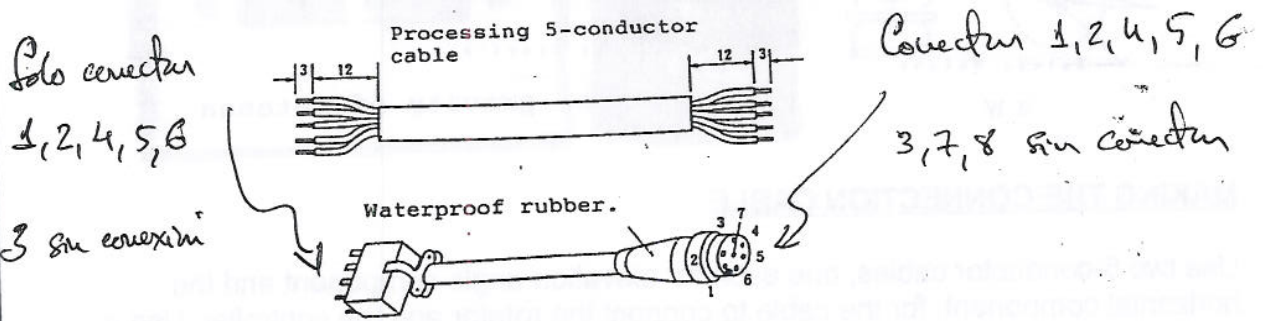
Process the terminal for both edges of the cable as shown in the figure 4. Install the attached 6-pin male square connector to one end of the cable, and 6-pin female square connector to the other end (the end for the main body). When the protection cover of the connector is removed, the number printed on the bottom of each pin can be seen. Solder the same color core wires to both ends so that the numbers match. Connection pin. No. 3 is a spare, and nothing is connected to it. Furthermore, before soldering, do not forget to insert the protective cover and the waterproof case into the cable.



0,5 mm<sup>2</sup>

### \*\*Horizontal component cable\*\* (for EV-800DX)

Process the terminal for both edges of the cable as shown in figure 5. Install the attached 8-pin male connector to one end of the cable, and the 7-pin female metal connector to the other end. When the protection cover of the connector is removed, the number printed on the bottom of each pin can be seen. Solder the same color core wires to both ends so that the numbers match. Connection pin No. 3, 7 and 8 are spares, and nothing is connected to them. Before soldering, do not forget to insert the protective cover and the waterproof rubber into the cable.



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**\*\*Trial testing\*\***

When the soldering of the cable and connector is completed, connect the controller and the rotator with each cable, and test the device before installing it on the tower, etc.

Furthermore, in order to adjust the azimuth of the display angle and antenna after installation on the tower, set the horizontal component to 180°, and the elevation angle component to 0° at the completion of testing.

When removing and recombining the elevation angle and horizontal component, first rotate the horizontal component until the display shows 180 degrees, then, in this state, install the elevation angle component so that its N display comes directly behind the metal connector of the horizontal component.

**ADJUSTMENT OF DISPLAY AND ANTENNA AZIMUTH**

When all installation and wiring has been completed, adjust the angle display of the controller and the antenna azimuth in the following order. Furthermore, temporarily tighten the U bolts attaching the antenna, etc. Also, it is helpful to have two people adjust the azimuth, one to watch the antenna rotation outdoors, and one indoors.

**Installation of horizontal-elevation angle single body\*\* (s. fig. 1)****\*\* Horizontal rotation\*\***

1. Turn on power for the controller, and confirm that the azimuth display is at 180°. If it is not at 180°, press either the RIGHT or LEFT key to bring it to 180°.
2. In this state, stabilize the horizontal component so that the outside antenna face due South. (stabilize it by adjusting the installation azimuth fine tuning ring)
3. Next, while pressing the LEFT key, watch the rotation of the outside antenna (without looking at the controller display) and stop it after half a rotation to where it faces due North.
4. When the controller's Azimuth display is not 360° at this time, adjust the AZ-ADJ control on the frontpanel of the controller with a small screwdriver until the display shows 360°.

**\*\* Elevation angle rotation (including EV-800X)\*\***

1. Confirm that the controller's elevation display is at 0°. If it is not at 0 degrees, press either the UP or DOWN key to bring it to 0 degrees.
2. In this state, set it so that the direction (Elevation angle) of the antenna's boom is horizontal and fix it with a U bolt.

## \*\*Trial testing\*\*

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3. Next, while pressing the UP key, watch the rotation of the outside antenna ( without looking at the controller display) and stop it after it has rotated 180°.
4. When the controller`s Elevation display is not 180 degrees at this time, adjust the EL-ADJ on the front of the controller with a small screwdriver until the display shows 180 degrees. In the case of EV-800X, adjust it with the rotation angle indicating adjustment volume on the rear panel of the controller.

**\*\* Separating and setting up the elevation angle and horizontal components (see figs 2 and 3).**

**\* the installation azimuth of the horizontal component on towers etc is free.**

1. Turn on power for the controller, and confirm that the azimuth display is at 180°. If it is not at 180°, press either the RIGHT or LEFT key to bring it to 180°.
2. In this state, loosen the screws of the mast clamp and fix the direction of the outside antenna due South. Excluding the above, the remainder is the same as the previous heading "Installation of the horizontal-elevation angle single body"

## USE OF REMOTE TERMINAL

The remote terminal on the rear panel of the controller is used to control EV-800DX/EV-800X externally.

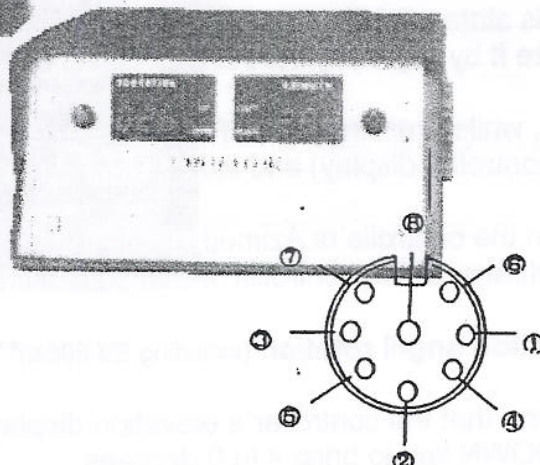
For example, it is possible to control the direction of the antenna, etc., freely by connecting a switch kept on hand to the remote terminal with a cable.

Also, by connecting a personal computer, automatic artificial satellite pursuit, memory presetting and other funtions can be used.

Each pin number and its arrangement diagram, and each pin operation is as follows (Each pin number is the pin number marked on the back socket)

### \*\* EV-800DX:.

1. Control of horizontal LEFT rotation
2. Control of horizontal RIGHT rotation.
3. Control of elevation angle rotation upward
4. Control of elevation angle rotation downward
5. Horizontal angle display voltage
6. Elevation angle display voltage
7. DC15V, 200mA output (non-stabilized)
8. Ground

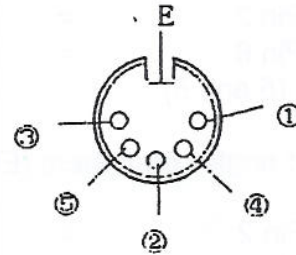


**\*\* Performance of each pin \*\***

Pins no. 1 to 4 run at LOW, and are it has being supplied +5V.  
The angle diplay voltage of no. 5 and 6 is from approximately DC (+) 0.06V to 4.2 V,  
according to the angle.

**\*\*\* EV-800X \*\*\***

1. Elevation angle display voltage.
  2. Control of elevation angle rotation upward.
  4. DC 8 V, 300mA output ( non stabilized)
  5. Control of elevation angle, rotation downward.
- E. Shield ground

**\* Performance of each pin \*\***

The angle display voltage of no. 1 is from approx. DC (+) 0.06V to 5 V according to the angle.

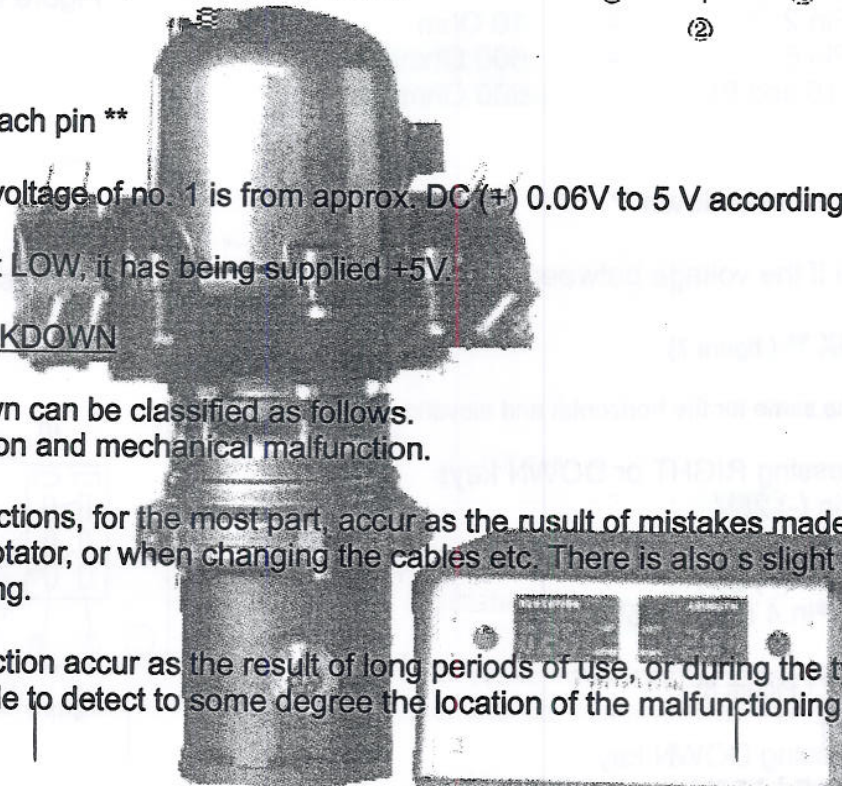
No. 2 and 5 rurd at LOW, it has being supplied +5V.

**EMOTATOR BREAKDOWN**

Emotator breakdown can be classified as follows.  
Electrical malfunction and mechanical malfunction.

Electronical malfunctions, for the most part, occur as the result of mistakes made when reinstalling the Emotator, or when changing the cables etc. There is also s slight case occur be struck by lightning.

Mechanical malfunction occur as the result of long periods of use, or during the typhoon season. It is possible to detect to some degree the location of the malfunctioning part using a tester.

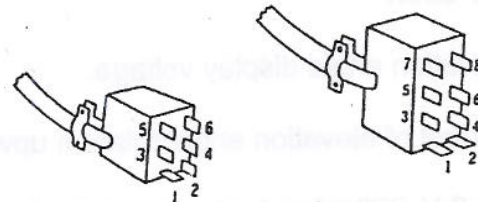


### \*\* Electrical malfunction of rotator \*\*

With the other end of the cable attached to the outside rotator, the normal approx. value of the direct current resistance between each of the pins in the figure 6 is as follows:

#### \*\* Horizontal component \*\*

Pin 1 and Pin 2	=	10 Ohm
Pin 4 and Pin 6	=	1000 Ohm
(4 and 5) + (5 and 6)	=	1000 Ohm



Pin no. 3 is spare      Pin no. 3,7,8 are spare

#### \*\* Elevation angle component (EV-800X) \*\*

Pin 1 and Pin 2	=	10 Ohm
Pin 4 and Pin 6	=	600 Ohm
(4 and 5) + (5 and 6)	=	600 Ohm

Figure 6

### \*\* Controller breakdown \*\*

It is normal if the voltage between each of the pins on each connector is as follows.

#### \*\* EV-800DX \*\* ( figure 7)

(Values are the same for the horizontal and elevation angle).

1. When pressing RIGHT or DOWN keys

Pin 1 (+), Pin (-) 28V

2. When pressing LEFT or UP keys

Pin 1 (-), Pin 2 (+) 28V

3. Between Pin 4 and 6 15V

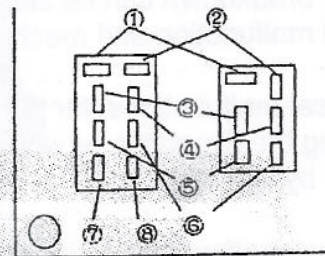


Figure 7.

#### \*\* EV-800X \*\* ( Figure 8)

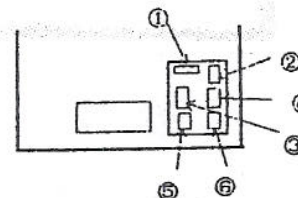
1. When pressing DOWN key

Pin 1 (+), Pin 2 (-) 31V

2. When pressing UP key

Pin 1 (-), Pin 2 (+) 31V

3. Between Pin 4 and 6 7V



### \*\* Mechanical malfunction \*\*

If there is no abnormality when testing for electrical malfunction, then the malfunction is mechanical. However, it is difficult to judge the location of the malfunction by external examination only. In the case of mechanical malfunction, remove the Emotator from the tower and consult your supplier.