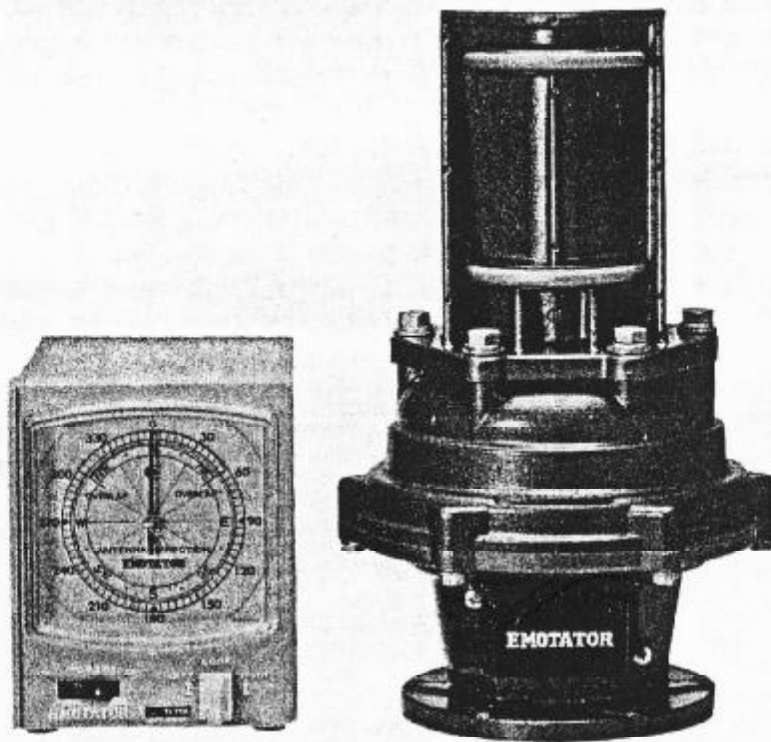


INSTRUCTION MANUAL

FOR

MODEL 747-SRX

# EMOTATOR



 **EMOTATOR CORPORATION**

## THE WORLD RENOWN "EMOTATOR"

You are now the proud owner of the famed EMOTATOR Amateur Radio Antenna Rotator, made by Emoto Antenna Mfg. Ltd.

Our 30 years of market acceptance throughout the world by the discriminatory amateur radio operators are due to our capable engineering expertise by our engineering department and the continuous technical R&D work for advanced workmanship.

We are a specialized antenna rotator manufacturer, producing for the Amateur Radio, T.V. broadcasting stations, news media, electric power companies, weather bureaus, local and foreign ship building industries and many other industrial applications.

Please read this instruction manual carefully before installation.

### CAUTION

1. Installation must be made as per photograph at the front page. You can not operate the EMOTATOR with top and bottom reverse or horizontally.
2. The wiring of 5-conductor cable must be made properly. At least, check the wiring 2-times before starting the operation.

Wrong wirings damage IC or precision electronic parts of the Emotator, and sometimes, can not operate even rewired correctly.

3. When solder the 5-conductor cable, please choose high quality solder.

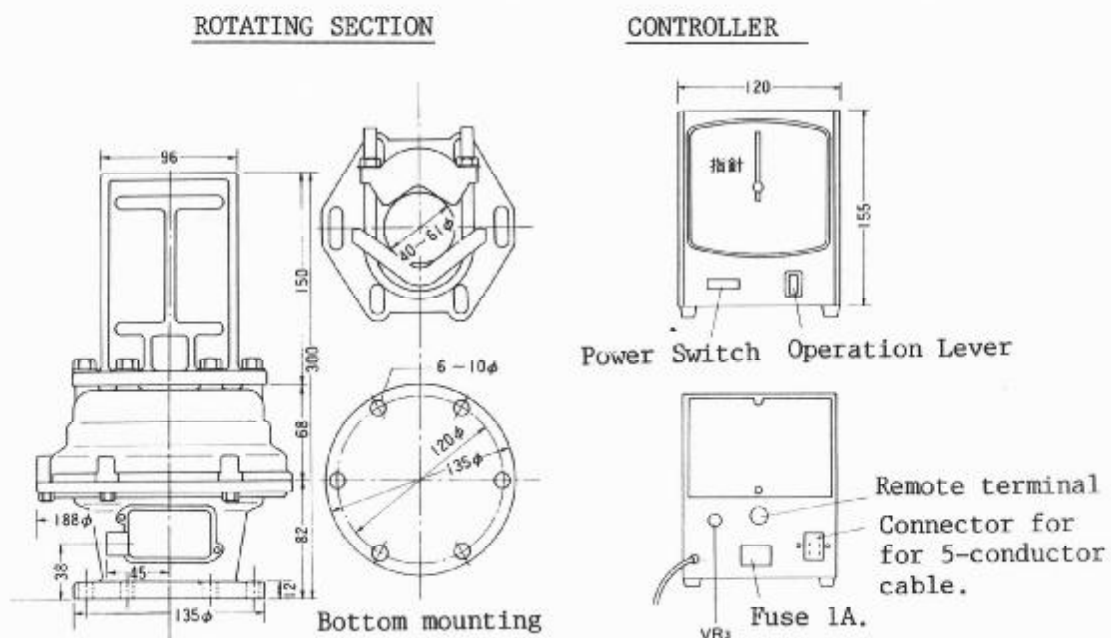
### CONTENT IN A PACKAGE

Rotor.	1 Pc.
Controller.	1 Pc.
Mast bracket.	1 Pc.
Mast clamp.	2 Pcs.
8mm U-bolt with nut & spring washer for mast clamp.	2 Pcs.
8x25 bolt with washer for mast bearing mounting.	6 Pcs.
8x35 bolt with nut & spring washer for mounting.	6 Pcs.
Waterproof case(Packing, band, cap & mounting screw)	1 Pc.
6-pin female connector.(Without cover)	1 Pc.
6-pin Connector plug with cover.	1 Pc.
Instruction manual.	1

## CONSTRUCTIONS AND SPECIFICATIONS.

The rotating mechanism is incorporated in a die-cast housing. Rotating speed is only 35 seconds for one rotation and total angle of rotation is 470 degree. This unit is optimal for satellite communication or round QSO. The friction braking system(patented) has been taken to stop antenna at any direction freely with no braking noise. Recommend the EMOTATOR model 747-SRX for sharp beam antenna like VHF, UHF and SHF. The circle controller is equipped with a remote terminal for computer control or remote control.

Please do not use on marine vessels. When using on marine vessels, use of the model 200 Emotator that is specially manufactured for use on ship is recommended particular.

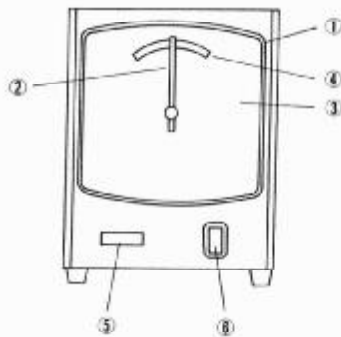


## MAIN SPECIFICATIONS.

ELECTRIC POWER SOURCE:	<del>115V, 220V</del> , 240V AC, 50/60Hz, 50VA.
CONTROLLER OPERATION VOLTAGE:	DC 24V.
ONE ROTATION TIME:	35 Sec.
ROTATION TORQUE:	700Kg.cm.
BRAKING TORQUE:	7000Kg.cm.
ALLOWABLE ANTENNA WIND SURFACE:	2 Meter <sup>2</sup> .
ALLOWABLE ANTENNA FLY WHEEL EFFECT (GD <sup>2</sup> ):	400Kg.cm.
ALLOWABLE BENDING MOMENT:	2000Kg.cm.
ANTENNA MAST DIAMETER:	40 - 61mm.
CONTROL CABLE:	5-conductor.

## FRONT PANEL OF THE CONTROLLER AND OPERATION

Fig. 1.



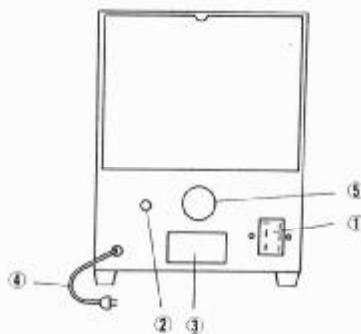
Please refer the Fig. 1.

1. Needle pointer protection frame.  
This is a removable from outside. Remove when you wish to change the direction plate to a map or when adjust the direction of needle pointer and Antennas.
2. Needle pointer.  
By pulling the center axle of needle pointer, it comes off and the needle pointer rotate with finger. Antenna and needle pointer rotate same degree.
3. Direction plate.  
After removed 1 and 2, changeable to a map.
4. Overlap line.  
Total rotation angle is 470 degree. This is a spare direction line of +/- 55 degree. (Center line of 470 degree can be set at any position)
5. Power Switch.
5. Rotation operation Lever.  
Antenna rotates RIGHT direction when pushed Lever RIGHT. Push the Lever LEFT to rotate Antenna LEFT. Slide up for LOCK position and slide down for UN-LOCK.

## EXPLANATION OF BACK SIDE OF CONTROLLER.

Fig. 2

Please refer the Fig. 2.



1. Cable Connector. 6-pin square type.
2. Needle pointer rotation adjustment Volume.  
This is a Volume control of adjusting one rotation of rotating section and Needle pointer.
3. Fuse Holder. Insert 1A Fuse.
4. Power supply cable.
5. Remote connecting Socket.  
By using this Socket, remote control of antenna direction is available with simple switch. Or memory of degree and automatic pursuit satellite communications through connect connect with micro-computer is available.

### 6. Explanation of remote connecting Socket. (See Fig. 3.)

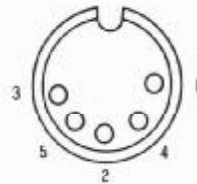
No. 1 pin: Output is made by changing direction degree to Voltage.

Changing Voltage is 0.06V - 5V(+/- 0.12V). If input the memory through an A/D Converter, connection with Micro-computer of digital display etc is available.

No. 2, 5 Pin: Operation Pin for Right and Left. It works with TTL level LOW.

No. 4 Pin: Can be used as a external power source for a compact electric equipment of Vcc, Output DC8V, 0.35A.

Fig. 3 Remote connecting Socket. View from back side of controller.



HOW TO CONNECT THE 5-CONDUCTOR CABLE AND CONNECTER.

Rotating section and controller must be connected with 5-conductor cable. Please choose the 0.5square mm over/1-conductor cross section cable.

The tip of both end of 5-conductor cable should be processed as per the following illustration and solder the supplied connecter at both end.

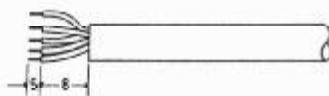
Then connect 6-pin female connector to rotating unit side and connect 6-pin connecter plug at the other side.

Pin numbers are being marked on each pin of the connecter. Connect the same pin number with same conductor of calbe. Pin No. 3 is unnecessary to connect. Do not forget putting the waterproof case, waterproof cover and proteciton cover on a way of 5-conductor cable before soldering the connecter.

Note; When connect the connecter, please choose high quality solder for electronics.

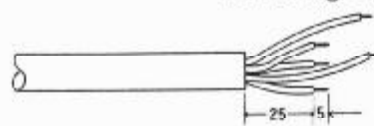
Controller side.

Solder plating

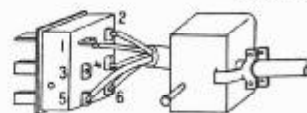


Rotating unit side.

Solder plating.



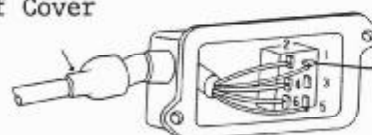
Connector Plug.



Protection Cover

No. 3-pin - Free

Waterproof Case



Female Connector

No. 3 Pin - free

## CONNECTION OF CABLE AND ROTATING UNIT

Before install the Emotator on the Tower, connect cable to the Emotator. This work is easily made on the ground and operation test also can be made before installation.

Before connect cable, securely fix the waterproof Cover, Band and waterproof Case. See Fig. 6.

Fig. 5 is an exsample installation when used Roof Tower. Please install with same manner even used another type Tower.

Normally, so long 5-conductor cable is used. Due to the weight of 5-conductor cable, a big tension comes on the Connector. This cause a short contact of connector pin or a short of 5-conductor cable. Please fix the 5-conductor cable securely at a part of Roof Tower with Vinyl tape etc.

In the next, do not combine the 5-conductor cable and a Coaxial cable from Antenna. If combined both together, Controller sometimes does not workk properly due to an influence of RF. Therefore, apart 5-conductor cable more than 30cm from Coaxial cable.

Fig. 6

After securely fixed connector, cover with waterproof case.

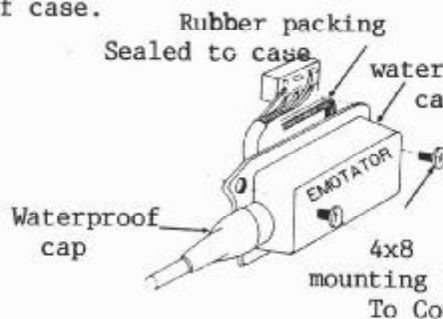
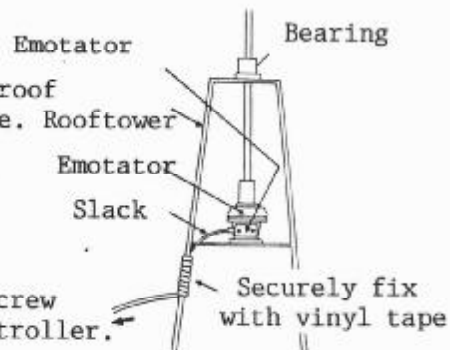


Fig. 5

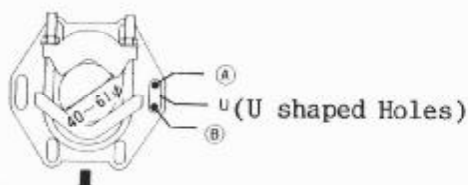
Antenna Mast



### ANTENNA MAST AND MAST CLAMP BRACKET.

The shape of mounting holes of Mast clamp bracket is an ellipse as per Figure below.

When use 60mm diameter Antenna Mast, pull the 6 Pcs of Bolts to direction of an arrow (Bolts must be positioned at A). Or when use 40mm diameter Antenna Mast, bolts must be positioned at B).



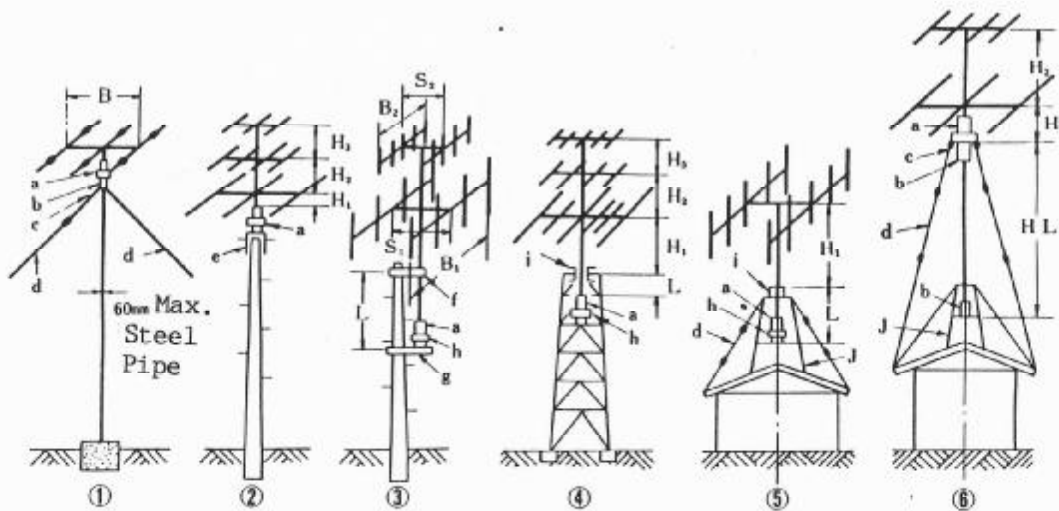
ANTENNA TOWER AND ANTENNA MAST MOUNTING

1. The antenna towers can be installed and assembled in six different ways as per below.

1. Steel Pipe Mounting
2. Panza Mast Mounting
3. Panza Mast Mounting
4. Steel Tower Mounting
5. Roof Mounting
6. RoofMounting

Fig. 7 Various Antenna mounting system.

\*In case of the mounting system 1, 2, and 6, total length of Antenna Mast should be less than 1.5 meter.



- |                |                        |                  |
|----------------|------------------------|------------------|
| a. 747-SRX     | e. Panza Mast Cap.     | i. Stay Bearing. |
| b. Mast Clamp. | f. Mast Bearing.       | j. Roof Tower.   |
| c. Stay Clip.  | g. Emotator support.   | k. Antenna mast. |
| d. Stay Wire.  | h. Universal Coupling. |                  |

2. The Antenna Mast mounting can categorized into two systems.

- a. Mounting system 1, 2, and 6 can be mounted directly to the Emotator mast clamp. This is called the "INDEPENDENT MOUNTING SYSTEM". Where the Emotator is to be mounted Fig. 7, system 1 and 6, it will necessary to attach the Mast clamp bracket model 1217(Not supplied) to the under side of Emotator.

b. Mounting system Fig. 7, 3, 4, and 5, the center of Antenna Mast is supported by Mast Bearing or Stay Bearing. This is called the "ROTATING ANTENNA MAST SYSTEM".

In this system, recommended the Antenna Mast length which higher than Mast Bearing or Stay Bearing( $H1 + H2 + H3$ ) should be less than 3.5 meter even if used 60mm diameter steel pipe. The length of "L" is normally 1.5 - 2 meters. In these systems, do not forget taking an earth, especially on mounting system 5 and 6.

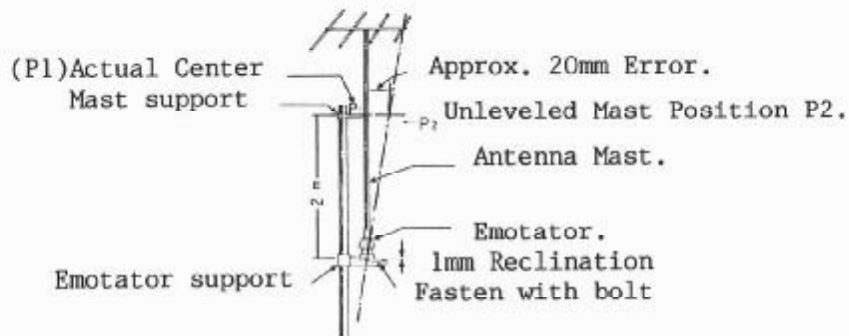
When the Emotator is installed in a tower, as in this case, it must be fixed tightly with bolts on the Rotator mounting plate in the Tower. This mounting surface must be perfectly flat, and the top tower hole must be concentric with the axis of rotation of the top part of the Emotator.

For example, predetermine the surface level when using this mounting system. As per illustrated below, if the reclination is more than 1mm, the Mast can not be mounted and clamped in to a position. If the Emotator is mounted on a reclined position, the mounted mast will be mounted at an angle  $P2$  instead of  $P1$ . This is the reason why it has been stated earlier than the surface level must be absolutely level.

Do not force the Mast and the Emotator to be installed in this type of position. The 1mm reclination at the bottom of the Emotator will show approx. 20mm misalignment at the tip of the 2 meter length Mast.

Forcing this type of mounting will cause permanent damage to your Emotator.

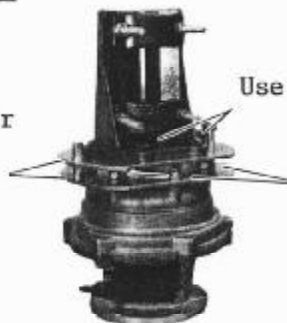
Owing to these circumstances, we recommend that our model 451 Universal Coupling be used to overcome these unforeseen problems.



HOW TO JOIN THE UNIVERSAL coupling.

Use screws supplied with Mast clamp and Universal coupling, and mount as per photo in right.

Universal coupling



Use bolts of mast clamp and nut of Universal coupling.

Use bolts of Universal coupling.



SIZE OF USEFUL ANTENNA FOR MODEL 747-SRX AND ANTENNA FLY WHEEL EFFECT

A simple explanation of this should be given here.

For example, an automobile is speeding at a given speed and the transmission is set at "NEUTRAL" and you still note that the engine power is not moving the rear two tires, but the automobile will keep running.

This is called the inertia running, and the same effect is present on the rotating antenna system.

Once it starts to rotate, even if the power source is CUT-OFF, the antenna and the Emotator, will keep rotating for a while. This is called the FLY WHEEL EFFECT ( $GD^2$ ).

The antenna system in the fly wheel rotation stage should not be stopped abruptly as it will generate a big force. The largeness of the fly wheel effect will depend on the antenna system, the larger antenna, the larger  $GD^2$ . It is very simple to taking into consideration an antenna system by checking  $GD^2$ .

Also, the value of WIND SURFACE AREA of antenna must be smaller than the allowable wind surface area of the Emotator.

FOR EXSAMPLE, THEEMOTATOR 747-SRX.

<u>KIND OF ANTENNA</u>	<u>A</u>	<u><math>GD^2</math></u>
T4E	0.6	200
10E4P	0.8	80
<b>TOTAL:</b>	<b>1.4m<sup>2</sup></b>	<b>280Kg.m<sup>2</sup></b>

\*Model 747-SRX's allowable  $GD^2 = 400Kg.m^2$ , and allowable wind surface area  $A = 2m^2$ . Therefore, the above antennas are no problem to use.

TABLE 1. FLY WHEEL EFFECT AND WIND SURFACE OF VARIOUS ANTENNA.

	A	$GD^2$	A	$GD^2$	A	$GD^2$	A	$GD^2$	A	$GD^2$	A	$GD^2$
HF	7M2EVP	1.0 240	7M3EVP	1.8 460	7M2EF	2.2 800	7M3EF	3 1500	7M2ECQ	2 450	7M3ECQ	3 700
	14M3EF	0.8 160	14E4EF	1.2 330	14M5EF	1.75 750	14M6EF	2.2 1200				
	21M3EF	0.4 40	21M5EF	0.8 200	21M7EF	1.5 800	21M2EHV	0.3 20	21E2HQ	0.4 40	21M6EF	1.3 650
	28M4EF	0.31 35	28M5EF	0.7 60	28M2EHV	0.3 18	28M2EHQ	0.31 35			21M8EF	2.5 1600
HF	7.14M3EVP	0.5 190	7.14M4EVP	0.8 200	14.21M3E	0.35 150	14.21M4E	0.4 160	14.21M5E	0.55 400	21.28M3E	0.3 150
	T3E Jr	0.4 60	T3E	0.5 160	T4E	0.6 200	T5E	0.7 380	T6E	0.8 420	T2ECQ	0.5 58
50M HZ	4E	0.3 3.2	4E2S	0.6 6.4	4E2P	0.6 65	2EHV	0.2 12	2EHQ	0.28 30	4EHQ	0.5 200
	5E	0.35 40	5E2S	0.7 80	5E2P	0.7 300	6E	0.4 50	6E2S	0.8 100	6E2P	0.8 350
144 MHZ	6E	0.14 1.0	6E2P	0.3 6	6E2P2S	0.6 12	6E4P	0.6 50	6E4P2S	1.2 100		
	8E	0.18 2	8E2P	0.36 8	8E2P2S	0.85 16	8E4P	0.85 66	8E4P2S	1.7 130		
	10E	0.2 3.5	10E2P	0.4 11	10E2P2S	0.8 22	10E4P	0.8 80	10E4P2S	1.6 160		
	12E	0.22 5	12E2P	0.5 30	12E2P2S	1.0 60	12E4P	1.0 100	12E4P2S	2.0 200		
	11E8P	1.5 520	X8E	0.22 3.1	X8E2P	0.45 12	X10E	0.3 5	X10E2P	0.6 19		
430 MHZ	10E	0.06 0.35	10E2P	0.1 1.4	10E2P2S	0.25 4	10E4P	0.2 5.8	10E4P2S	0.4 12	12E	0.06 0.5
	12E2P2S	0.25 4	12E4P	0.3 10	12E4P2S	0.6 20	15E2P	0.15 3.6	15E2P2S	0.3 7.5	15E4P	0.6 8.5
	25E2P2S	1.5 110	25E4P2S	2.2 465							15E4P2S	1.2 17

A=Wind Surface  $M^2$ ,  $GD^2$ =Flywheel effect  $Kg.m^2$ , E=Element, P=Parallel stack, S=Vertical stack, CQ=Cubical Quad, HV=HB9CV, HQ=Swiss Quad, VP=Short Beam, Jr=Junia type, F=Full size, X=Cross Element, T=Tri Band.

### ADJUSTING THE NEEDLE POINTER DIRECTION AND THE ANTENNA DIRECTION.

When finished the all of wiring and installation, adjust the needle pointer direction and the antenna direction by the following way. (See Fig. 8).

1. Switch on the power Switch.
2. Push the Lever 5 to left direction till needle pointer and rotating unit stop.
3. After stopped, remove Cover 1 and adjust center line 8 of overlap paper 6 to the direction you wish.
4. Adjust needle pointer by finger to the left position 7 of overlap paper 6. Also, fix antenna with screw temporarily. (The direction of antenna at this stage is no matter)
5. Then push the Lever t to Right direction till antenna rotates  $360^{\circ}$  exactly.
6. After antenna rotated  $360^{\circ}$ , if the needle pointer is not at left position 7 of overlap paper 6, adjust needle pointer to 7 position with Volume control on the back side of controller.
7. Once again, push the lever to left direction till stop.
8. After stopped, confirm if the needle pointer is at 7 position of overlap paper 6. Push the lever to the right direction and stop needle pointer at center line 8 position of overlap paper 6. Then, adjust the direction of antenna to the direction of needle pointer and fasten with "U" bolt of mast clamp. The direction adjustment has finished.

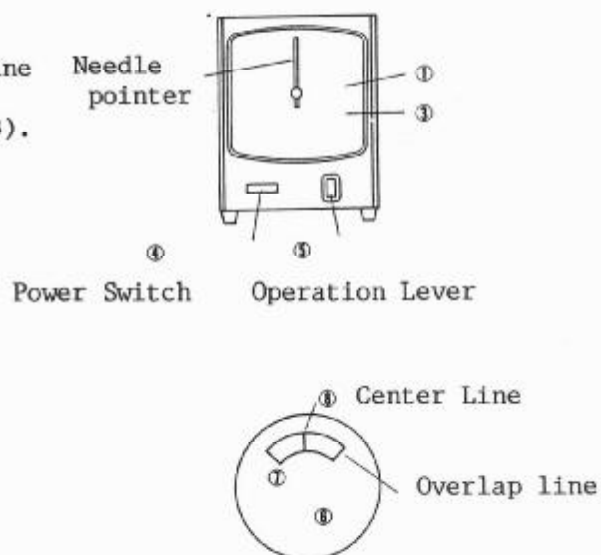
### \*CHANGIN OF NEEDLE POINTER START POSITION.

The above explanations 1 to 8 are based on the center line 8 was at N-direction when shipped from factory. If change from south to south or from east to east, change overline paper and needle pointer to south or east at the start time(Above explanation point 3).

### \*HOW TO INSERT AMAP.

Remove protection cover 1, needle pointer, transparent plate 3, overlap line plate and scale plate. Then put a map you like and remount in reverse order.

Fig. 8



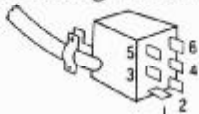
## TROUBLE OF THE EMOTATOR.

Trouble of the Emotator can be distinguished to an Electrical Trouble and a mechanical Trouble. The most of electrical trouble occur when installed the Emotator newly or mistake of wiring when replaced the control cable. In very few occasion, electrical trouble occur by being struck of lightning.

By using a tester, some of electrical trouble can be found.

### TROUBLE OF ROTATING UNIT

Connecting with rotor.



Pin No. 3 is free.

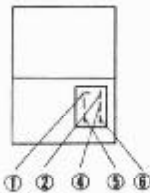
when the other end of cable has being connected with rotating unit, normal DC resistance between each pins are:-

Pin No. 1 - 2: 110 ohm.

4 - 6: 600 ohm.

(Pin No. 4 - 5) + (Pin No. 5 - 6) = 600 ohm.

### TROUBLE OF CONTROLLER



When a power switch is ON and plug is OFF, normal voltage between each pins are:-

When pushed lever to Right:-

Pin No. 1(+) - Pin No. 2(-) = 31V.

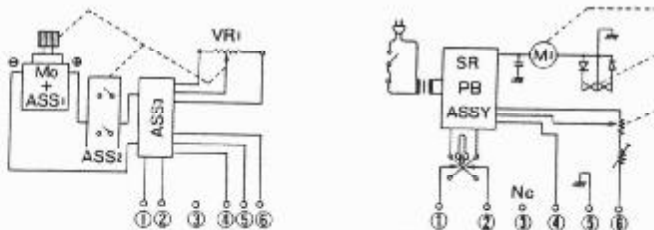
When pushed lever to Left:-

Pin No. 1(-) - Pin No. 2(+) = 31V.

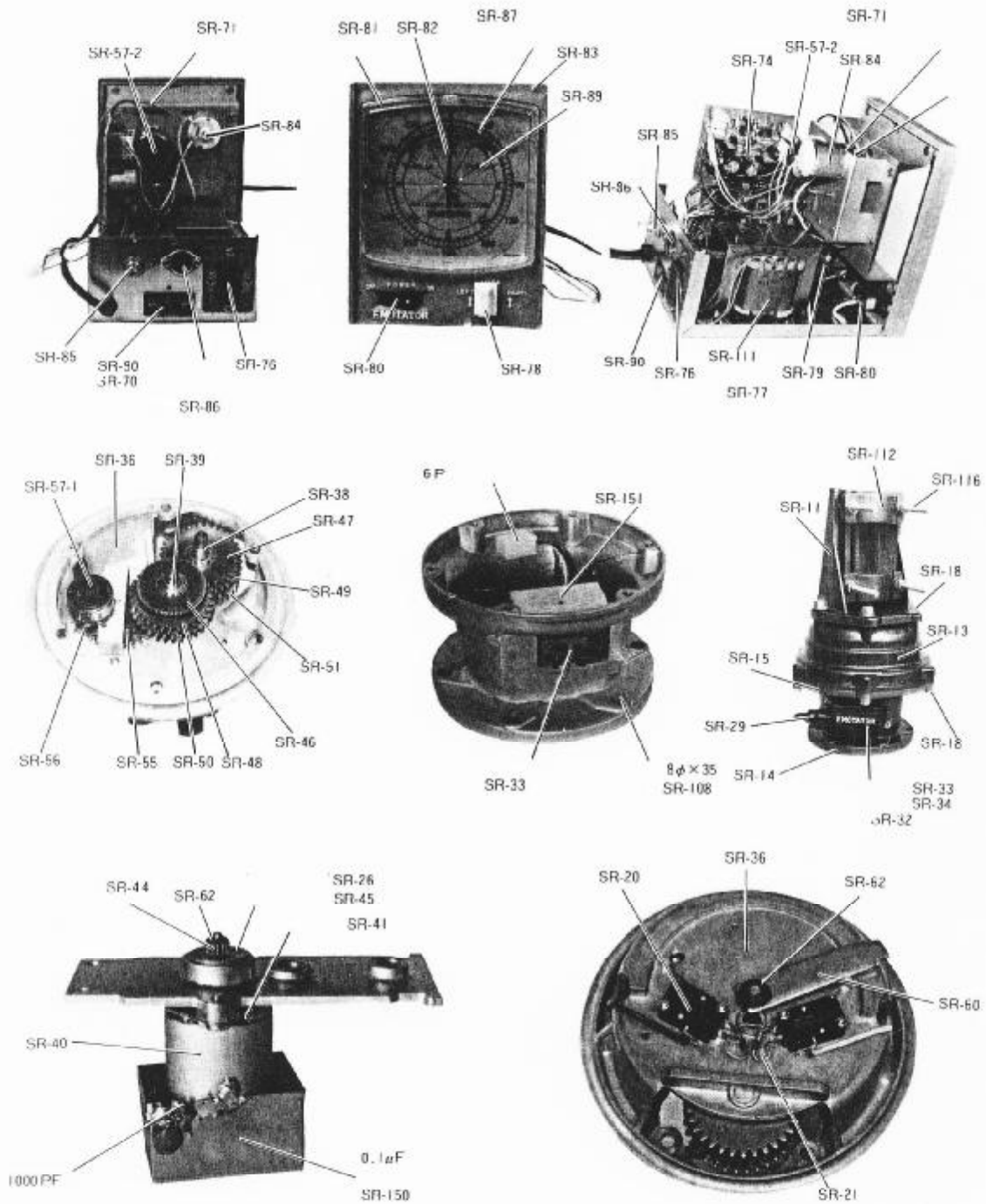
Pin No. 4 - 6 = 7V.

### ELECTRIC CIRCUIT DIAGRAM

\*Electric circuit block diagram is as follows.



PARTS NUMBER AND POSITIONING



THE EMOTATOR MODEL 747-SRX PARTS LIST

<u>PART NO.</u>	<u>DESCRIPTIONS</u>	<u>PART NO.</u>	<u>DESCRIPTIONS</u>
SR-11	Mast Bracket.	SR-60	Stop Lever.
SR-13	Gear Case.	SR-62	Push Nut.
SR-14	Motor Case.	SR-65	6 x 12
SR-15	Ring.	SR-70	1A fuse.
SR-18	6x20 Bolt	SR-71	8V lamp.
SR-20	Micro Switch.	SR-72	SR Trans.
SR-21	LS Diode.	SR-73	Servo Assembly.
SR-22	VR Bracket.	SR-74	SR PCB Assembly.
SR-24	VR drive Gear.	SR-75	Chassis.
SR-26	BK spring.	SR-76	6-P connecter for chassis.
SR-29	Waterproof Cover.	SR-77	6-p connecter for cable.
SR-31	9.5mm dia. ball.	SR-78	Operation Knob.
SR-32	Waterproof Case.	SR-79	Switch Assembly
SR-33	6P connecter Plug.	SR-80	Power Switch.
SR-34	6P socket.	SR-81	Needle pointer protection frame.
SR-36	Gear Frame.	SR-82	Needle Pointer.
SR-38	Long collar	SR-83	Panel.
SR-39	Short collar.	SR-84	DC Motor.
SR-40	Motor.	SR-85	Angle adjustment VR.
SR-41	Motor Frame.	SR-86	5-pin DIN Connector.
SR-42	4x10	SR-87	Scale Plate.
SR-44	Pinion Gear	SR-88	Map.
SR-45	BK Rotor.	SR-89	Overlap plate.
SR-46	No. 1 Gear.	SR-90	Fuse Holder.
SR-47	No. 2 Gear.	SR-108	8 x 35
SR-48	No. 3 Gear.	SR-111	Trans.
SR-49	No. 4 Gear.	SR-112	Clamp
SR-50	No. 5 Gear.	SR-116	8mm U-bolt
SR-51	No. 6 Gear.	SR-119	8 x 25
SR-55	VR counter Gear.	SR-150	Shield box Assembly.
SR-56	VR Gear.	SR-151	Shield plate Assembly
SR-57-1	N-type VR.		
SR-57-2	Long shaft VR.		

\*When order the above parts, please advise not only part number, but also descriptions.