

A. M. 77S9-02-52

ENGLISH
INSTRUCTION MANUAL

830V-1



RADIO ANTENNAS

DIPOLE
TRANSPORTABLE
ROTATABLE
DIRECTIONAL
OMNIDIRECTIONAL

Creative Design Corp.

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A. XFOG. HAL 784

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ASSEMBLY MANUAL
MULTI BAND V-DIPOLE ANTENNA

830V-1

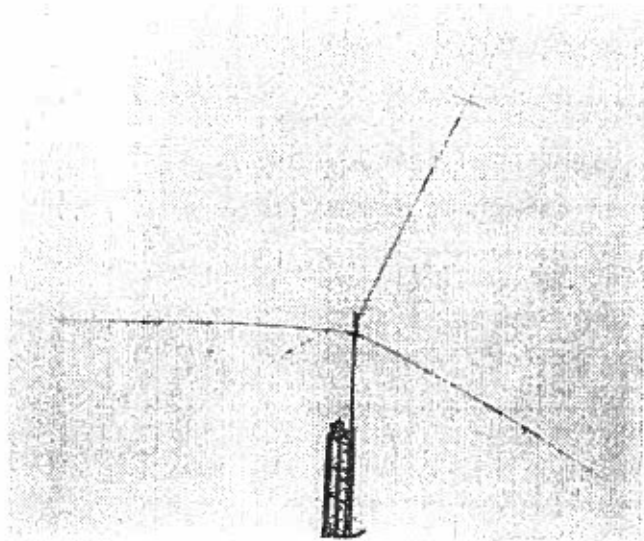


Figure 1 830V-1

1st edition 1995-6
Creative Design Corp.

1.1 GENERAL DESCRIPTION

830V-1 is a horizontal polarization, adjustable V angle, V type dipole antenna of multiband for HF band. The operating frequency band contains 10, 18 and 24MHz. Trap elements of the radiator are used for frequency selection that makes each band resonant it. Each band resonates with the electrical length of half Lambda(half wave). As 830V-1 antenna is designed for such a limited space in where the rotating radius is small, and so it is slanted 90 degree both upwardly and downwardly relative to the horizontal and vertical planes at the center of radiator elements, limiting variation of input impedance due to surrounding metal objects. For those who has a better installation condition can expand its V angle wider by either 140° or narrower by 90° while the standard V-angle is 170°. Low loss traps and loading capacitors are employed for keeping good radiation efficiency of the antenna. A broad band balun is used at the input section of the antenna for preventing undesired radiation and for securing a good radiation pattern.

1.2 SPECIFICATIONS

Frequency	10,18,24 MHz
polarization	Horizontal
VSWR	Less Than 1.5:1
RF Power Capability CW(50%)/PEP	1/3 kW

Element Length	10 m
Element Height	4.9 m
Weight	5 Kg
Wind Survival Rating	35 m/s
Wind Surface Area	0.18 m ²
Mast Diameter	42 - 61mm

1.2.1 VSWR CHARACTERISTICS

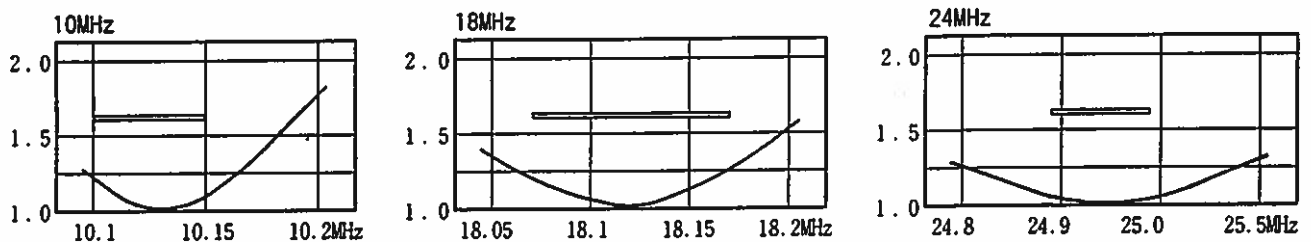


Figure 2 VSWR Characteristics

"WARC" World Administrative Radio Conference

1.3 ASSEMBLY

The model 830-1 is supplied complete and corresponds to the drawings contained in this manual. Refer to the PARTS LIST in the Section 1.5 for a complete breakdown of the parts for this antenna after unpacking. Check if there is any parts missing. If any defective parts are found, follow the instructions for the guarantee. The completed 830V-1 is illustrated as in Figure 3, and the details of the assembling of each portion instructed in Figure 4. Electrolytic corrosion of joints must be taken into account as an important consideration. Apply a silicone grease or machine grease in each tubing joints and insertion part. Trap elements has a proper setting direction, set the trap unit T1 and T2 in the correct position as they have water drain holes in the trap case. Holes are facing downwardly. It is also important to tighten the screws securely but there is no need to overtighten until the tubing is getting deformed since it makes decrease the entire strength. Mount the balun at the lower side of mount bracket in the mast after antenna is mounted in the mast tubing. It is advisable to closely wrap protective vinyl type around coaxial connector in the balun input section.

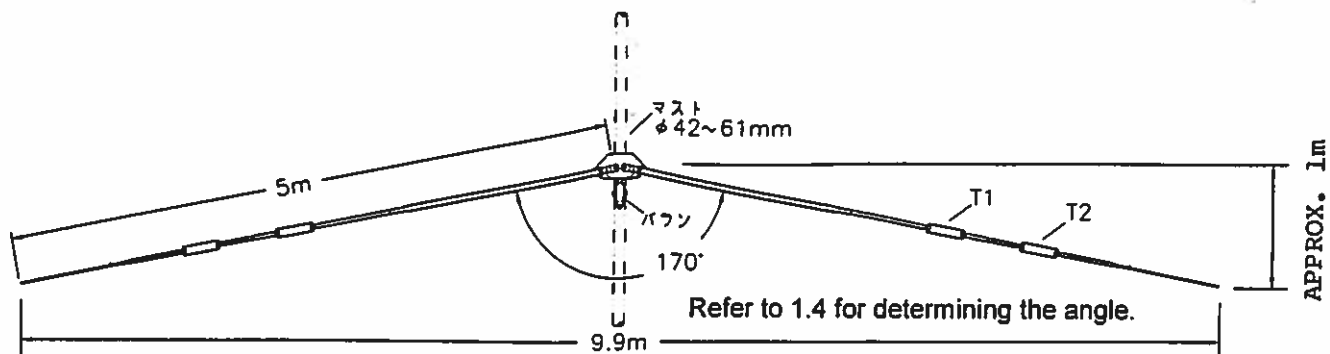
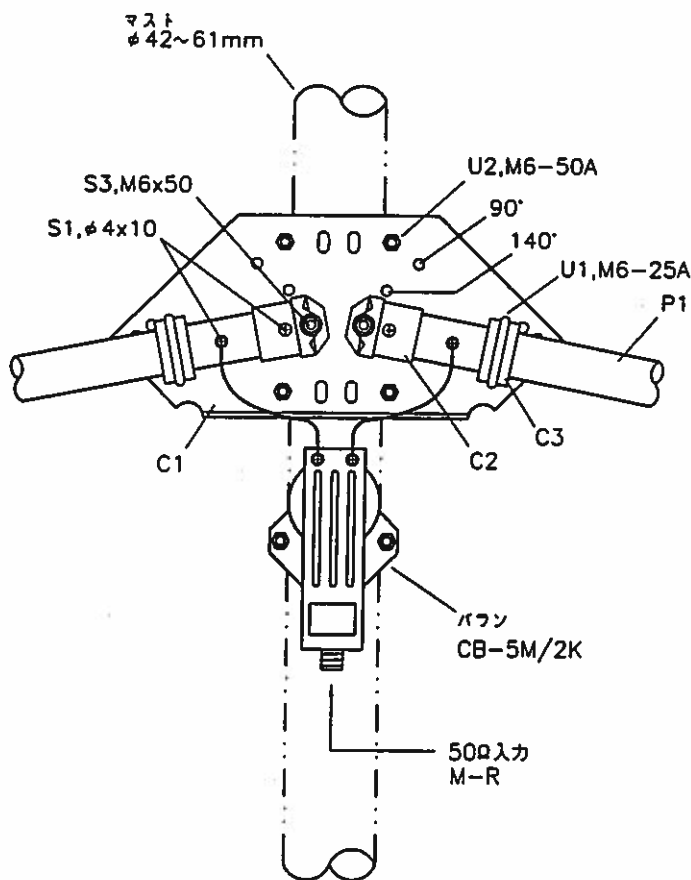
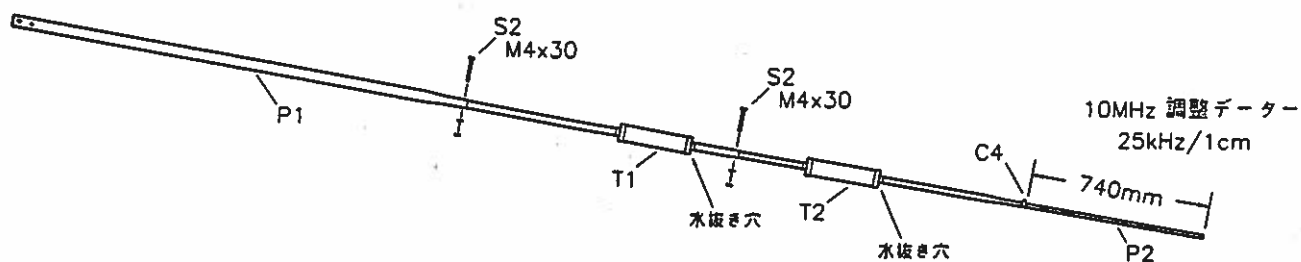


Figure 3 V-Dipole Antenna 830V-1



CAUTION

- Do not mount this antenna in the reverse position.
- To protect balun, do not hang coaxial cable direct down from the balun. Tie coaxial cable to the somewhere in the supporting mast tube using vinyl tape so as not to apply certain force of to the balun unit owing to the weight of coaxial cable.
- Encapsulate the conductive points using a silicon glue or equivalents to protect balun from entering rain water.
- Closely wrap vinyl tape around balun connector so that water cannot enter into it.

Notes:

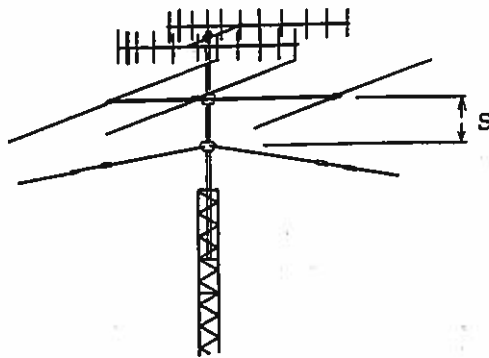
- 1) The V angle shown in this illustration is only the sample, setting its angle at 170°. To change this angle to either 90 or 140° needs to change mounting position of C2 & C3.
- 2) Generally, larger V angle will shift the resonant freq. to lower side (frequency).

Figure 4 Antenna Assembly

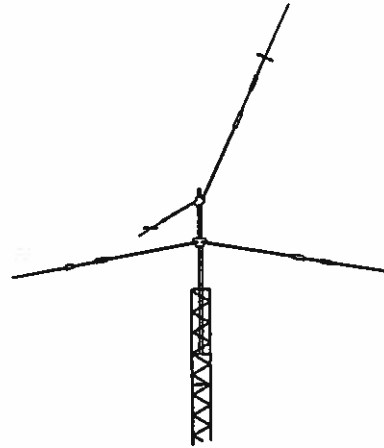
1.4 SITE SELECTION/A PREFERABLE SITE FOR 730V-X

A variety of installing conditions for antenna are available for 830V-1 antenna when compared with a genuine dipole antenna since element is bent in V shape downwardly. It enable to mount as an inverted Vdipole, stacking with another antenna such too (such as 730V series) or the Yagi type array etc. Normally radiation angle is et at 170°, however if it does not allow to secure enough space 'S' from other stacked antenna, it may cause a bad effect to either the antenna. If it is the case, turn the either the upper or lower antennas by 90° and make the direction in the element of 830V-1 is set by angle, or reset radiator angle either the 140° or 90°. Figure 5 shows an installation examples of 830V-1.

Stacking with Yagi Array



Stacking with Dipole Antenna



Stacking each antenn at 90° agnle if mutual antenna is dipole gives less effect.

Figure 5. Antenna Installation Examples

1.5 PARTS LIST

The model 730V-x antenna is supplied complete and corresponds to the drawings contained in the manual. Refer to the PARTS LIST below for a complete breakdown of parts after unpacking.

Item	Description	Materials	Q'ty
P1	TUBE D30x1900	Alum.	2
P2	TUBE D10x 900	Alum.	2
T1	TRAP 24MHz	Alum.	2
T2	TRAP 18MHz	Alum.	2
C1	MAST BRACKET MC300V	Galv.	1
C2	SOCKET DA30	AAS	2
C3	HOLDER DB30	AAS	2
C4	TUBING CLAMPER EC1	Alum.	2
S1	SCREW D4x10 W	Sus.	4
S2	SCREW M4x30 W. N.	Sus.	4
S3	SCREW M6x50 W. N.	Sus.	2
U1	U-BOLT M6-25A W. N.	Sus.	2
U2	U-BOLT M6-50A W. N.	Sus.	2
F1	BALUN ASSY CB5M/2K, w/Wire, M6-50A U-Bolts	H86	1

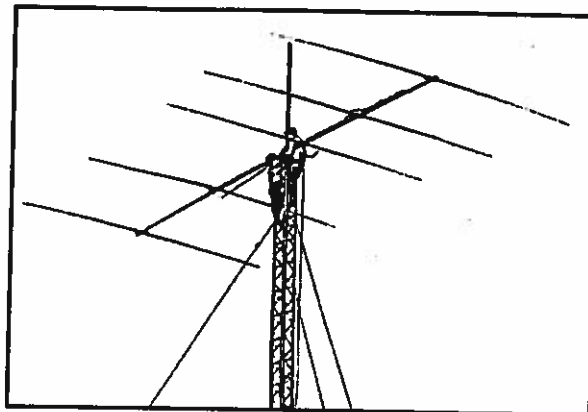
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ASSEMBLY & INSTALLATION HF HAM ANTENNAS



BEFORE ASSEMBLING

Read the following instructions carefully as you assemble your antenna, whether you do it for the first time or if you have prior experience.

STRUCTURE OF CD ANTENNAS

The CD antennas are designed for long term durability and ease of assemble. The electrical performances of the CD antenna as described in the specification are guaranteed if it is used approximately 18 meters above the ground, since it is designed with the intention of its use at such a height. The CD antenna is also designed for good durability if it is assembled properly. To ensure the good durability carefully read the following description.

1. PARTS SORTING AND NECESSARY TOOLS

After unpacking the parts package, check to see if all the listed parts are contained, referring to the parts list, and inspect to see if defective or damaged parts are contained. It is advisable to put screws and nuts in a small box, for example. Further, carefully study and understand the functions and use of the parts, referring to the drawings, before assembling the antenna. Assemble the antenna with a great care, even veterans are prone to make mistakes.

Requirement Tools:

- | | |
|---|--|
| 1) Spanner Wrenches | 5) Adhesive Vinyl Tape (and Grease) |
| 2) Cross-Head Screw Driver (2 or 3 pcs. in different sizes) | 6) Safety Belt |
| 3) Cutting Plier | 7) Rope |
| 4) Measuring Tape | 8) Pulley (Require if antenna weight is approx. 20kg. or above.) |

2. FOR IMPROVING THE DURABILITY OF YOUR ANTENNA

Since antennas are located outdoors, they are exposed to corrosion by weathering, salty mist or sulphur dioxide gas and the like.

Unless certain protection is provided at the time of the assembly and installation, the function of a new antenna cannot be maintained. Electrolytic corrosion of joints must be taken into account as an important consideration. Bolts and clamps as mechanical components need to be given a rust preventive coating. Those joint or contact sections which are electrically important where located between the stub and elements and the balun output lead terminal must be protected against the electrolytic corrosion.

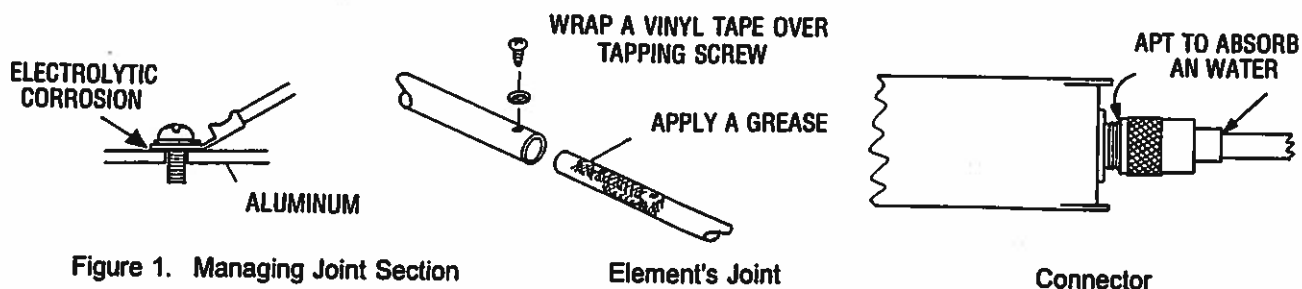


Figure 1. Managing Joint Section

CAUTION

AN IMPROPER ASSEMBLY OF ANTENNAS FREQUENTLY OCCURS WHEN IT IS ASSEMBLED BY A GROUP OF WORKMEN. THIS MAY USUALLY ARISE FROM THE DIFFERENT SKILLS, INSUFFICIENT KNOWLEDGE ON ANTENNA, AND OR A BAD TEAMWORK. IF THE ANTENNA ASSEMBLED BY A GROUP OF WORKMEN, A FINAL CHECK BY AN EXPERT IS ESSENTIAL.

DIMENSIONS OF THE ELEMENTS

As shown in Fig. 2, the dimensional value with reference to each drawing and illustration in the instruction manual are meant to say the demenstions measured from center of the element tubing. Since the traps have a certain directivity when putting them together with another trap or tubing, be sure that they must correctly be jointed in the proper direction.

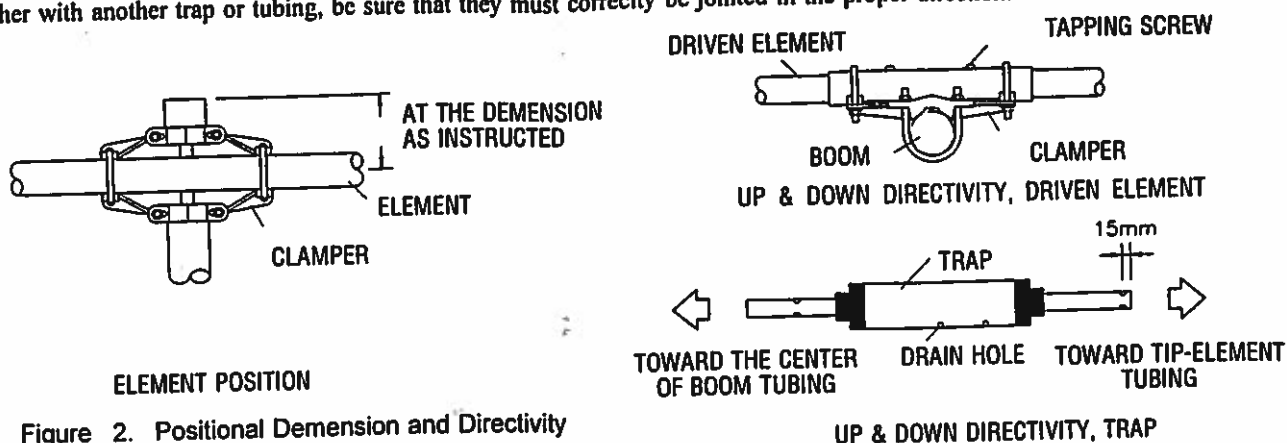


Figure 2. Positional Dimension and Directivity

3. THE ASSEMBLY ORDER AND ANTENNA INSTALLATION

The way to assemble an antenna varies with the type of situation of the site. Think carefully to find the best way to hoist your antenna up onto the top of the tower first. Care must be taken into considration especially if there is a dangerous objects surrounded around the site. If antenna is too large to assemble the element on the ground, it is advisable to hoist the boom with being one or two element tentatively absent and suspend the boom using a rope through pulley attached at antenna supporting mast, then mount the elements later one element by one element as shown in Figure 3. Connect a coaxial cable later after the antenna is installed and fixed on the mast. Priory attach the expansion coaxial cable from the feed point as far to the mast position if the antenna is such type that has a long boom in length that can not reach to the feed point from the mast position.

3.1 Installation Order For A Self-Supporting Tower

Asmble the antenna in the following procedures if all the assembling can be made down on the ground.

- 1) Booom Assembly (Stub, balun and mast bracket are priory mounted.)
- 2) Assembly of Each Element.
- 3) Installation of Each Element to the Boom.
- 4) Inspection of Assembly and Dimension

3.2 Installation Onto A Guy-Supporting Tower

In the guy-supporting tower, loosen all the guy wires of the tower and tentatively get out of the away or remove them for not to obstruct the hoisting the antenna. It is not dangerous to do so without guy-wire tentatively if the foundation in such an tower of its height of 30 meter or less is sufficiently made properly as instructed in the manual. In case if it is necessary to remove one of the guy wires or some part of guy wires, it is also required to loosen other guy wires also to loosen the tension to a certain extends. Hoisting of the antenna must be made by using rope and pulley till it is lifted up to the top of the tower, be sure to climb up the tower for fixing of antenna after guy wire is surely restored back to the original state. Be sure to do this work only when there is no wind.

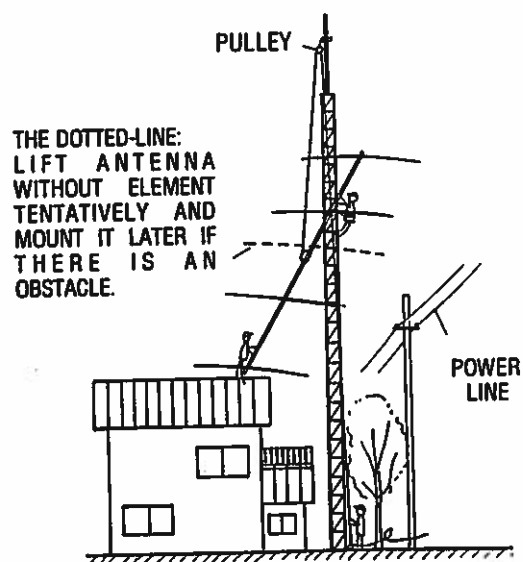


Figure 3. Antenna Installation Onto A Tower

CAUTION

- 1) BE SURE TO LOOSEN ALL THE REMAINING GUY WIRES ALSO EVEN IF THE ONE OF THE GUY WIRES IS TENTATIVELY REMOVED.
- 2) BE SURE TO DO THIS WORK WHEN THERE IS NO WIND.
- 3) HOIST AN ANTENNA WITH A USE OF ROPE AND PULLEY, AND BE SURE TO CLIMB UP THE TOWER AFTER ALL THE GUY WIRES ARE SURELY RESTORED TO THE ORIGINAL STATE. (SECURELY RE-FASTENED.)

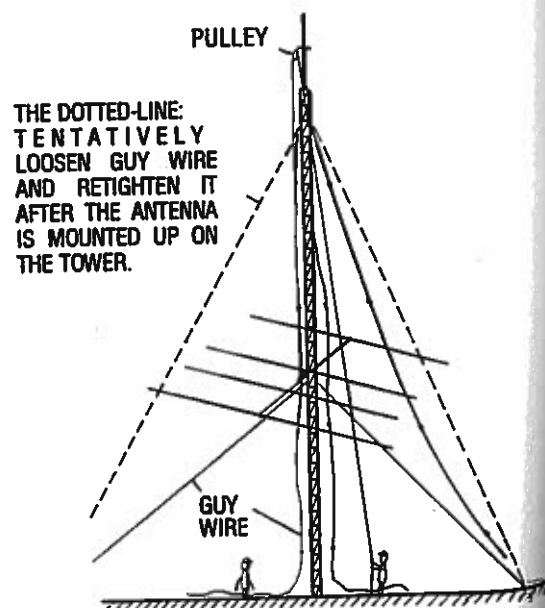


Figure 4. For A Guy-Supporting Tower

TAKING A RECORD OF MEASURED CHARACTERISTICS OF THE ANTENNA

When antenna installation and checking the antenna characteristic including VSWR measurement are completed, make the records of them is recommended as it will help a lot for the future maintenace in order to find to presume the inherent of performance and cause of the deterioration of the antenna if something is going wrong in the antenna characteristic. In such a low band antennas below 7MHz, the characteristic of antenna such as beam pattern, gain may change as it was used to be. Referring to the recorded data will able to find out the solution.

Model No.	Serial No.	Date of Installation	Year:	Month:	Day:
Opposed Station Measured At:		/km	Ant:	Misc:	
F/B Ratio	FS Ratio				
dB	dB/	MHz			
dB	dB/	MHz			
dB	dB/	MHz			
Remarks:					

	VSWR	SWR Meter:		
2.5				
2.0				
1.5				
1.0				

MHz
MHz
MHz

4. HOW TO OBTAIN THE BEST PERFORMANCE OF AN ANTENNA

It is best to have the height of an antenna as high as possible above the ground and to use it as a single unit. An antenna height equal to or greater than about 1 wave is good. However, any steel roofs and/or steel covered buildings in the neighborhood must be taken into account. Figure 5 shows a relationship between antenna height and its gain. The curve represents experimentally measured values, but they may not apply commonly to the entire range of frequency and/or to all the types of antennas. It must be understood, therefore that this just a reference. In the low frequencies of 7MHz band, a height of 40 meters is difficult to obtain but there is different advantage to maintaining antenna between 20 to 30 meters in height. Aside from the antenna height, a deterioration of performance is observed if an antenna is used with another antenna in a stacked manner. The extent of such a deterioration is generally -0.5 dB to 3 dB. The effect of the antenna stacking is greater in the case of the high frequency antenna's. For example, a Yagi antenna having 2 elements for 7 MHz and four elements for 14 MHz, which are stacked with a space of about 3 meters, has a gain drop of about 0.3dB. Another Yagi antenna having 4 elements for 14MHz and 4 elements for 21 MHz needs 2.5m or more to avoid 1 dB or more gain drop. In the four parallel stacked antenna of the multi-element type for 144 MHz band, the lower frequencyband antenna is greatly effected by the stacking. The VSWR characteristics and F/B ratio will indicate the degree of this stacking. One of the ways to minimize the stacking effect is to turn the upper and lower antennas 45-90 degrees from each other stacking effect, as shown in figure 6.

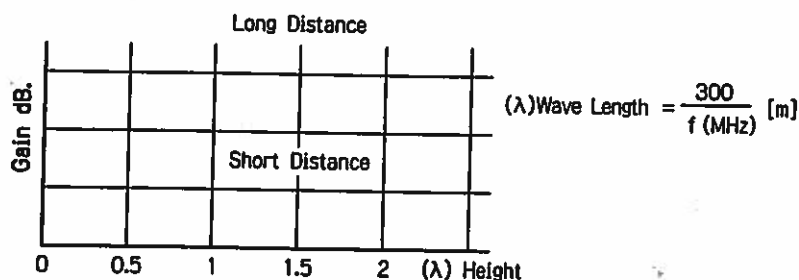


Figure 5. Antenna Height and Gain

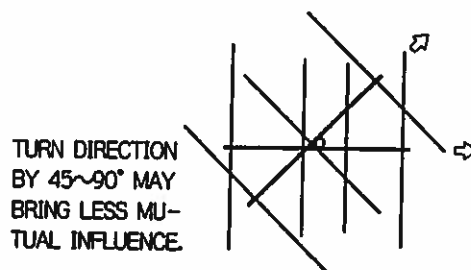


Figure 6. Direction and Mutual Influence

5. GAIN AND RADIATION ANGLE OF HF ANTENNA

As regards to an antenna gain on HF bands, care must be taken into considration in the interpretation on its specification document as the way of expression stipulated in thier specification document provided by some of antenna manufacturers both domestic and overseas ones are somehow difference. Although it is not the gain considering the influence of the ground (reflection from the ground) in the V-UHF bands because the antenna hight, most of the case, is respectfully far high against wave length, in HF band of which its height is not satisfied enough to 1λ (1 wave length) however, is greatly influenced by the ground. Owing to the communication by means of reflection of the ionosphere in HF bands, TOA (Take-Off Angle) is an important factor that TOA tends to be smaller when the antenna height is higher. Fig. 7 shows the radiation pattern in elevation plane of CY153 (3-ele monobander for 21MHz) at the height of 10meter above the ground, TOA is approximately 20° and due to the ground reflection, its gain derived is 3~6dB greater than that of the gain derived in the free space. In the CY153 at 10m of height, the most efficient communication range is figured out approximately 1800km when ionosphere at the height of 400km/h (F2 ionosphere) is used for its reflection. If antenna height is 20m (1.3λ), TOA is apporox 10°, 4000km is most efficient communication range. Due to such a reason being different heights of antenna, there is a case that are not able to compare the gain of the antenna because the different communication ranges would be drived in the difference of the the height of antenna accordingly.

Incidentally, TOA is a kind of a perceptible occurrence that is not influenced by the number of element but is determined by both a quality of the of the ground (type of soil) and the antenna height. In order to find a most suitable TOA, refer to the graphical chart shown in Fig. 8 that shows the an applicable communication range and altitude of the ionosphere. TOA will be able to approximately be grasped by using the calculation value indicated later or by the means of computer simulation since it is almost impossible to make a survey or take a measurement actually.

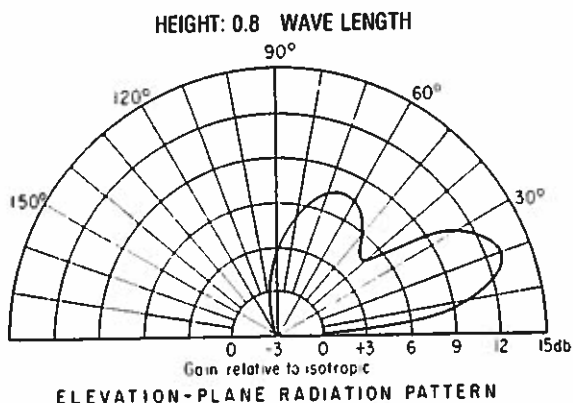


Figure 7. CY153 Radiation Pattern

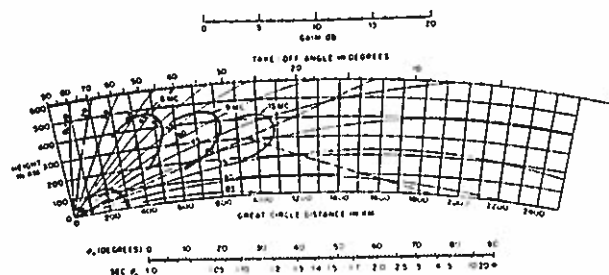


Figure 8. Radiation Angle and Communication Distance

6. RADIATION PATTERN ON BELOW 7MHZ BAND

As a characteristic of radio wave propagation, on the frequency band of those lower than 7MHz, is, during the day time, radio waves are reflected front the E the ionosphere(only 100 km high), so the first-hop path length is quite small, as shown in Fig. 9. D and E ionosphere layers disappear at night, and radio waves are reflected from the higher F2 ionosphere layer (200 km high), giving about double the daytime first-hop path length. Sometimes, mainly in winter, some high-angle radiation passes through the F2 layer to the F1 layer. The vertical radiation pattern of antennas for these bands is oval in shape, as shown in Fig. 10 - with both high-angle radiation for optimum daytime communication, and low-angle radiation E or winter evenings. On evenings in summer, and even on evenings in winter when sunspot number is high, high-angle short-hop propagation is the norm. This is particularly true on low-frequency bands, like 1.9 and 3.5/3.8MHz bands, so the antenna vertical radiation pattern for these bands is designed to be oval-shaped to take advantage of high-angle propagation.

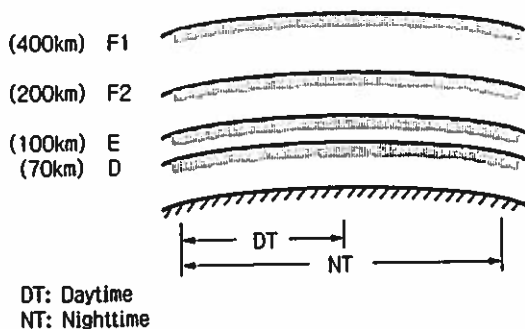


Figure 9. Ionospheric Layers and the Propagation

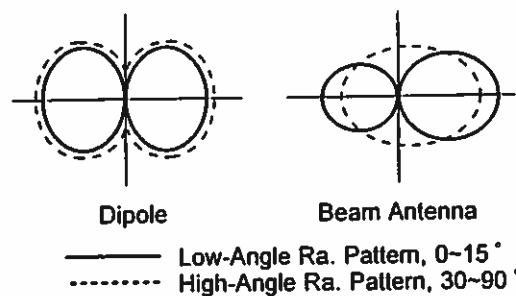


Figure 10. Beam Pattern on Different Radiation Angle

7. SUPERIOR YAGI BEAM ANTENNA

Beam antennas are the like designed to concentrate radiation energy into one direction. There are several kinds of Yagi types, designed for different purposes but simply increasing the number of elements does not necessarily increase the gain and F/B ratio significantly as it has a limit both electrically and physically. For V and UHF bands, the Yagi type is a most popular and widely used on those band and its gain increases is not number of elements but antenna among the other type of antennas except few instances of purpose, and its performance (forward gain) of Yagi type is determined depending on a structural design of parasitic array (reflectors and directors) but not number of the elements (beam length). Although it is very simple, the Yagi type of antenna is the typical antenna of that in which presents utmost reliability in offering high performance and strong mechanically as well. For example, most antennas used on 144 MHz for E.M.E (moonbounce) in the 1960s were collinear antennas - but in the 1970s, due to the above reasons, long-boomed Yagi antennas became mainstream. Now the Yagi is the mainstream beam antenna type on all bands from HF to UHF. CD selected the Yagi as its mainstream antenna product after considerable study of high-gain antennas. Comparing the Yagi with other types of antennas, and mixed designs, the Yagi antenna can hold its own.

1. GENERAL

Balun transformer Model CB-3F is an interface between a transmitter and antenna, which are different in the impedance. Generally, a half wave length dipole is used for the driven element. A current distribution in the dipole must be balanced with respect to its center. This state is called a balanced state. The coaxial cable is however unbalanced, the cable therefore is directly coupled with the driven unit and most RF energy is reflected at the feeding point to the feeder that is connected to a transmitter or receiver. This reflection takes place irrespective of VSWR. The result is that 100% RF energy from the transmitter can not be radiated from the antenna causing trouble the transmitter and television interference etc. (See figure 1).

Balun is used to interface between the balanced and unbalanced system. Model CB-3F designed for large power use and has a wide frequency characteristic of balancing ratio and a constant impedance characteristic. The Model CB-3F is classified into three types on the basis of the power handling capability. The power withstand of the balun is high for SSB but is about half as a large average power as CW and FSK. When the VSWR is about 2.5:1 or more, a balancing ratio and the power handling capability are reduced meanwhile the insertion loss is increased.

Note: In case of tuning the antenna using an antenna coupler, be sure to efficiently drop down the output power as not to damage the balun.

2. MOUNTING OF BALUN

Except some models, most of the Yagi type antennas manufactured by the CD are provided standard with the balun. Installation of the balun is by U-bolt as shown in figure 2. For mounting the balun, make sure that balun is not touched to clamp for the driven element and the drain hole of the balun case is faced downwardly. It may cause a phase deviation of RF radiation if a balun other than CD's is being used.

3. STUB ASSEMBLING

Before fixing the impedance matching stub to the element, bend the stub rod and shape it as shown in figure 2. Some models do not require such a bending work. Adjust the width between the each stub end so as to meet the both ends to fit the mounting position. For further details, see the instruction manual of each model.

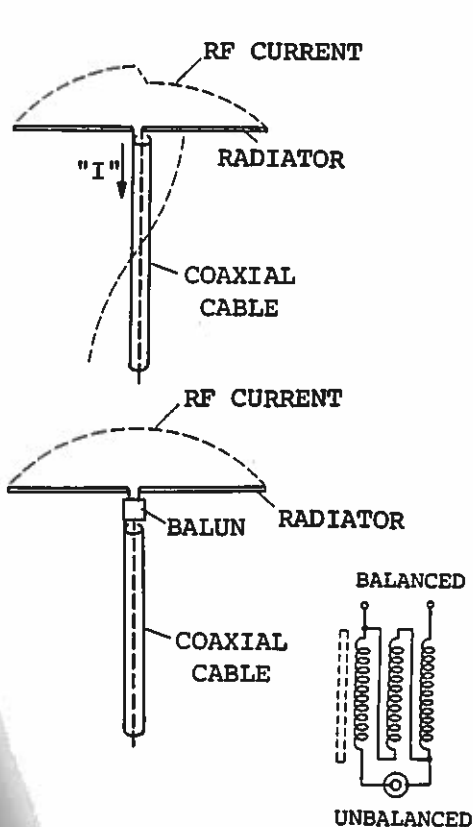


Figure 1. Function of Balun.

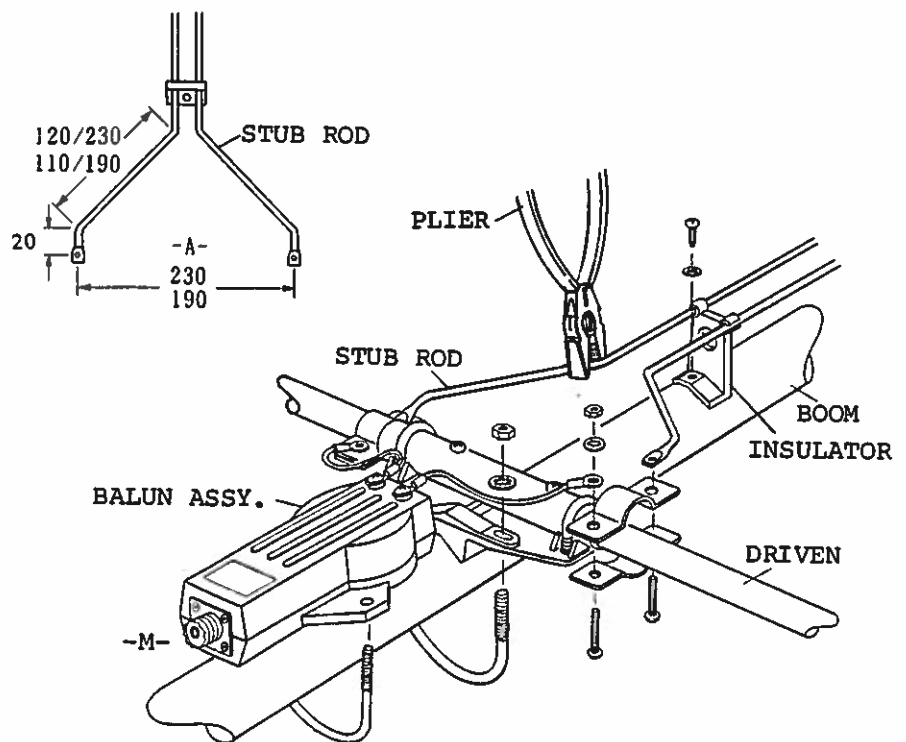


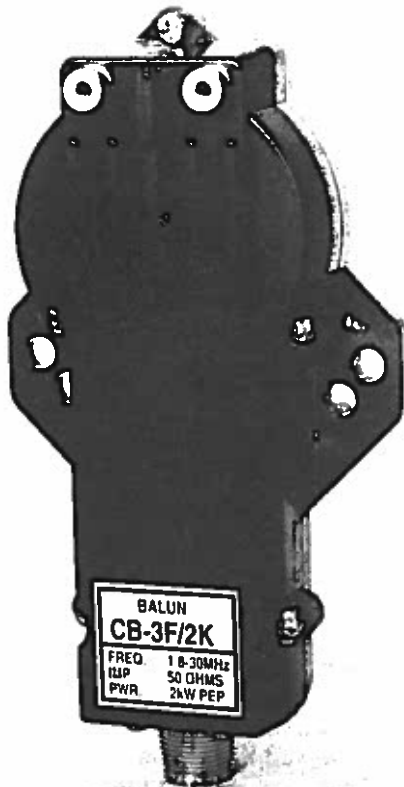
Figure 2. Balun Installation



INSTRUCTION

BALUN TRANSFORMER

CB-3F/X 1.8 to 30MHz



Model CB-3F/xK

Couples 50-ohm coax to open lines, permitting use of coaxial cable in the vicinity of transmitters and use of economical open line running to antennas. Greater than 97% power transfer efficiency. 1.2:1 insertion VSWR.

SPECIFICATION SUMMARY

Type	CB-3F/xK	2K	3K	4K
Frequency Range MHz		1.8~30	1.8~30	1.8~30
Power capability				
Average / PEP		0.8/2kW	2/3kW	2.5/4kW
(at 2:1 VSWR)				
Impedance (nominal)		50 ohms	50 ohms	50 ohms
Insertion VSWR		1.2:1	1.3:1	1.3:1
Insertion Loss Max		0.1 dB	0.1 dB	0.1 dB
(3~30MHz)				
Impedance Ratio		1:1	1:1	1:1
Input Connector		-M-	-M-	-M-
Tube Mounting (Dia.mm)		φ 35~63	φ 35~63	φ 35~63
Size W, L		64x140	64x140	64x140
Weight Net		180 g	200 g	230 g

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