

# **ASSEMBLY & INSTALLATION INSTRUCTIONS**

## **R3**

### **10-15-20 METER ANTENNA**

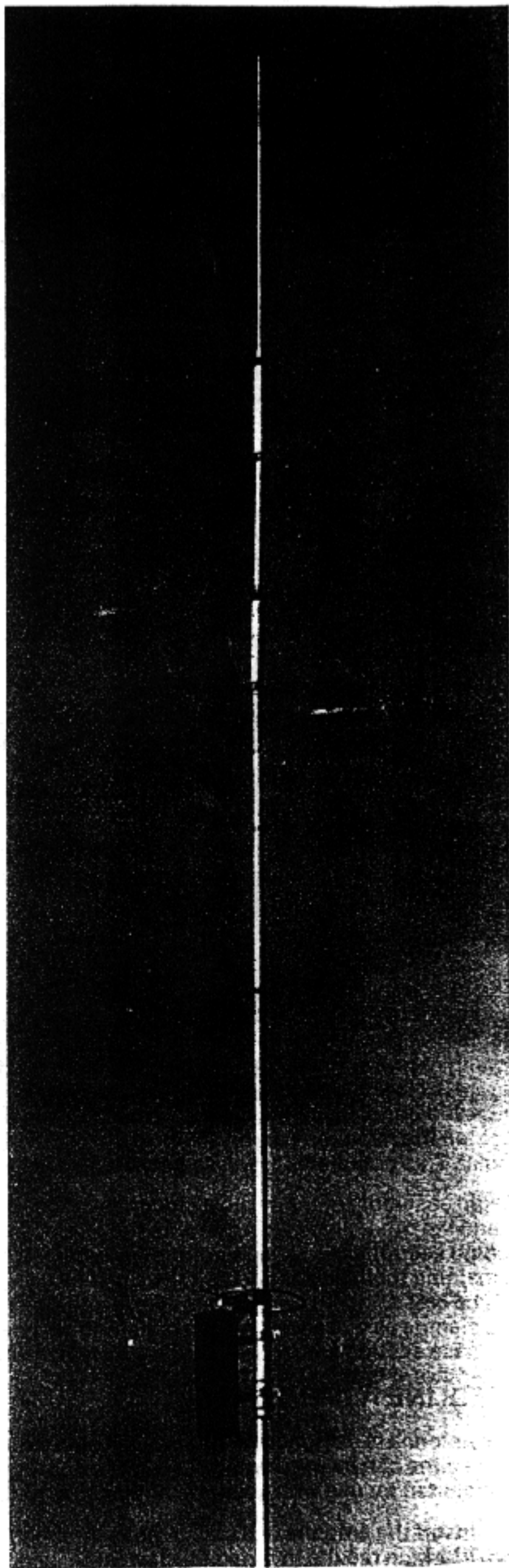


**cushcraft**

C O R P O R A T I O N

**THE ANTENNA COMPANY**

AR3681



**WARNING:**

THIS ANTENNA IS AN ELECTRICAL CONDUCTOR, CONTACT WITH POWER LINES CAN RESULT IN DEATH OR SERIOUS INJURY. DO NOT INSTALL THIS ANTENNA WHERE THERE IS ANY POSSIBILITY OF CONTACT WITH OR HIGH VOLTAGE ARC-OVER FROM POWER CABLES OR SERVICE DROPS TO BUILDINGS. THE ANTENNA, SUPPORTING MAST AND/OR TOWER MUST NOT BE CLOSE TO ANY POWER LINES DURING INSTALLATION REMOVAL OR IN THE EVENT PART OF THE SYSTEM SHOULD ACCIDENTLY FALL. FOLLOW THE GUIDELINES FOR ANTENNA INSTALLATIONS RECOMMENDED BY THE U.S. CONSUMER PRODUCT SAFETY COMMISSION AND LISTED IN THE ENCLOSED PAMPHLET.

Your Cushcraft R3 vertical antenna is designed and manufactured to give trouble free service. The antenna will perform as specified if the instructions and suggestions are followed and care is used in assembly and installation. When checking the tubing received with your antenna package using the parts list, it is easiest to identify the various dimensions of tubing by separating them by diameter.

**PLANNING:**

Plan your installation carefully. If you use volunteer helpers be sure that they are qualified to assist you. Make certain everyone involved understands that you are the boss and that they must follow your instructions. If you have any doubts at all, employ a professional antenna installation company to install your antenna.

**LOCATION:**

Extreme care must be used for your safety.

Although the R3 will operate in almost any location, it will perform best if it is in the clear. Surrounding objects such as trees, power lines, other antennas, etc., will reduce its efficiency. If possible mount the antenna high and in the clear.

Because your R3 does not require radials, it can be mounted in various locations. You roof top, balcony, garden, motor home roof, porch, deck, or tower top, etc., are all locations suitable for the R3. **YOUR MUST INSURE THAT NEITHER PEOPLE NOR PETS CAN COME IN CONTACT WITH YOUR ANTENNA WHILE IT IS IN OPERATION. DEADLY VOLTAGES AND CURRENTS MAY EXIST. ALSO, SINCE THE EFFECTS OF EXPOSURE TO RF ARE NOT FULLY UNDERSTOOD, LONG TERM EXPOSURE TO INTENSE RF FIELDS IS NOT RECOMMENDED.**

**ASSEMBLY:**

The first step in assembling your antenna is to assemble the ring section and matching network. Using figure 1 as a guide, assemble the ring on the base section. Next mount the tuning rods and matching circuit in place using figure 2. Carefully measure the lengths as shown in figure 2D to find the location of the tuning rods. Tighten all nuts and bolts securely. Place mast mount ring clamp (90) on the base section per figure 3. Now place the capacitor tuning assembly clamps (188) around the base and loosely assemble the nuts and bolts. Place the capacitor box on the clamps and tighten the machine screws (79) securely. Now tighten the remaining hardware on the capacitor box clamps. Form strap (189) onto the CTA RF output terminal. This completes the assembly of the base section.

Begin assembly of the vertical radiator section with the 1-1/4" x 48" (3.2 x 121.9 cm) aluminum tubing. Place it and the other pieces in a line with the slotted ends all toward the top of the antenna. You will have three tubing sections below the first trap (TF), one tubing section between traps and two sections on the top. The remaining tubing sizes and lengths are shown in figure 1. The overlap between AA-AB, AB-AC, TR-CA will be 4" (1.6 cm). Other tubing overlaps will be determined by the overall lengths required. It is easiest to tighten the clamps as you assemble the radiator from bottom to top. Place the assembled radiator 4" (5.1 cm) into the base section and tighten the (S-10) clamps securely.

**FEEDLINE ASSEMBLY:**

The antenna is designed for use with 50 ohm coaxial cable terminated with a PL-259 connector. Any length of feedline can be used with your R3. The shortest length cable will have the least loss. A connector boot is included for use with your new antenna. To get the most out of it please follow these directions.

1. Insert the antenna end of your coax through the small end of the connector boot. RG-8/U is a very tight fit which results in an excellent weather seal. Attach the PL-259 to your cable.

2. Cut off the top of the silicone seal package and apply a liberal amount to the threads of the connector mounted on the antenna (see figure 5). Screw the PL-259 on the feedline to this connector. Tighten it finger tight.
3. Now apply the remaining silicone to the outside of the connector. Cover it liberally. Be sure to cover the back as this will insure a good weather seal. Slip boot over the connector. Push it as far forward as possible. (DO NOT APPLY SILICONE TO THE CONNECTOR CENTER PIN OR SOCKET)

## INSTALLATION:

Following the guidelines in the LOCATION paragraph, place your antenna in its operating location. The base section will conveniently fit over a 1-7/8" (4.8 cm) O.D. tube.

Connect the control cable to terminal strip on the bottom of CTA. Spade lugs on the control cable ends will assist in making good and lasting connection.

Now connect your feedline to the R3. Installation of a Cushcraft Blitz Bug will aid in the dissipation of static electricity. Run your feedline and control cable to your operating position. Attach the feedline to your transmitter and the control cable to the control box. Be sure that the control cable is connected in the same sequence at both ends. Color coded cable will make this easier to achieve.

## INITIAL ADJUSTMENT:

After assembly and installation of your R3, the lengths can be verified using the following procedure.

Turn ON the control box (CBA) and activate the TUNE switch to move the meter needle to the right end of the 10 meter strip. Set your transmitter to 28.000 MHz. Using a wattmeter or SWR bridge set to the reflected power position, adjust the antenna for minimum reflected power using the TUNE switch. If the SWR is above 1.5 to 1 at the lower band edges, lengthen section A (figure 4) by 1 in. (2.54 cm). It may be necessary to repeat this step several times until the SWR is below 1.5 to 1.

Now move the meter indicator to the other end of the 10 meter strip. Set your transmitter to 28.8 MHz. After minimizing the reflected power, using the TUNE switch, measure the SWR. If it exceeds 1.5 to 1 shorten section A. Repeat this step until the SWR is below 1.5 to 1.

Follow the same procedure for each end of 15 meters, adjusting section B. Use the same procedure to optimize each end of 20 meters, adjusting section C.

## OPERATION:

To tune the R3 to your operating frequency, turn the control box ON, then activate the TUNE switch to move the indicator to the point on the meter near your operating frequency. As the meter indicator moves toward your frequency you may hear the signal levels in your receiver increase. Fine tuning can be accomplished by moving the TUNE control while monitoring the reflected power with a wattmeter or SWR meter. With a little practice you will be able to achieve very low SWR at any point on 10, 15 or 20 meters. Use the control box only as a guide. The SWR readings are the most important factors in capacitor positioning.

## TROUBLE SHOOTING:

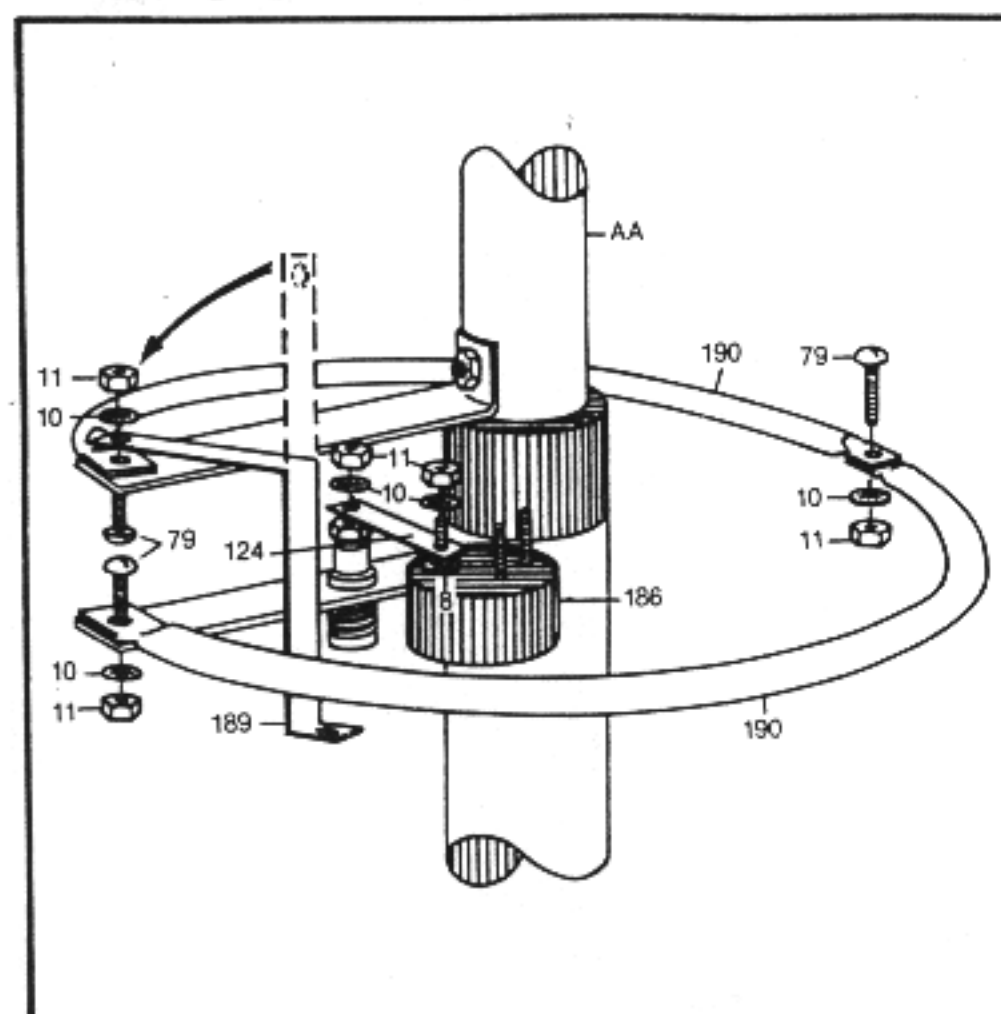
A trouble shooting guide has been provided to allow quick diagnosis of the most common problems.

Disconnect the control box from the control cable. Verify the voltages at the terminal strip on the rear of the control box. They should agree with Table I. A lighted meter face usually indicates the power transformer is working. In case the proper voltages are not encountered refer to the schematic diagram in Chart II.

If the problem has not yet been isolated, remove the control cable from the CTA. Check the resistances found on the CTA terminal strip with those found in Table II.

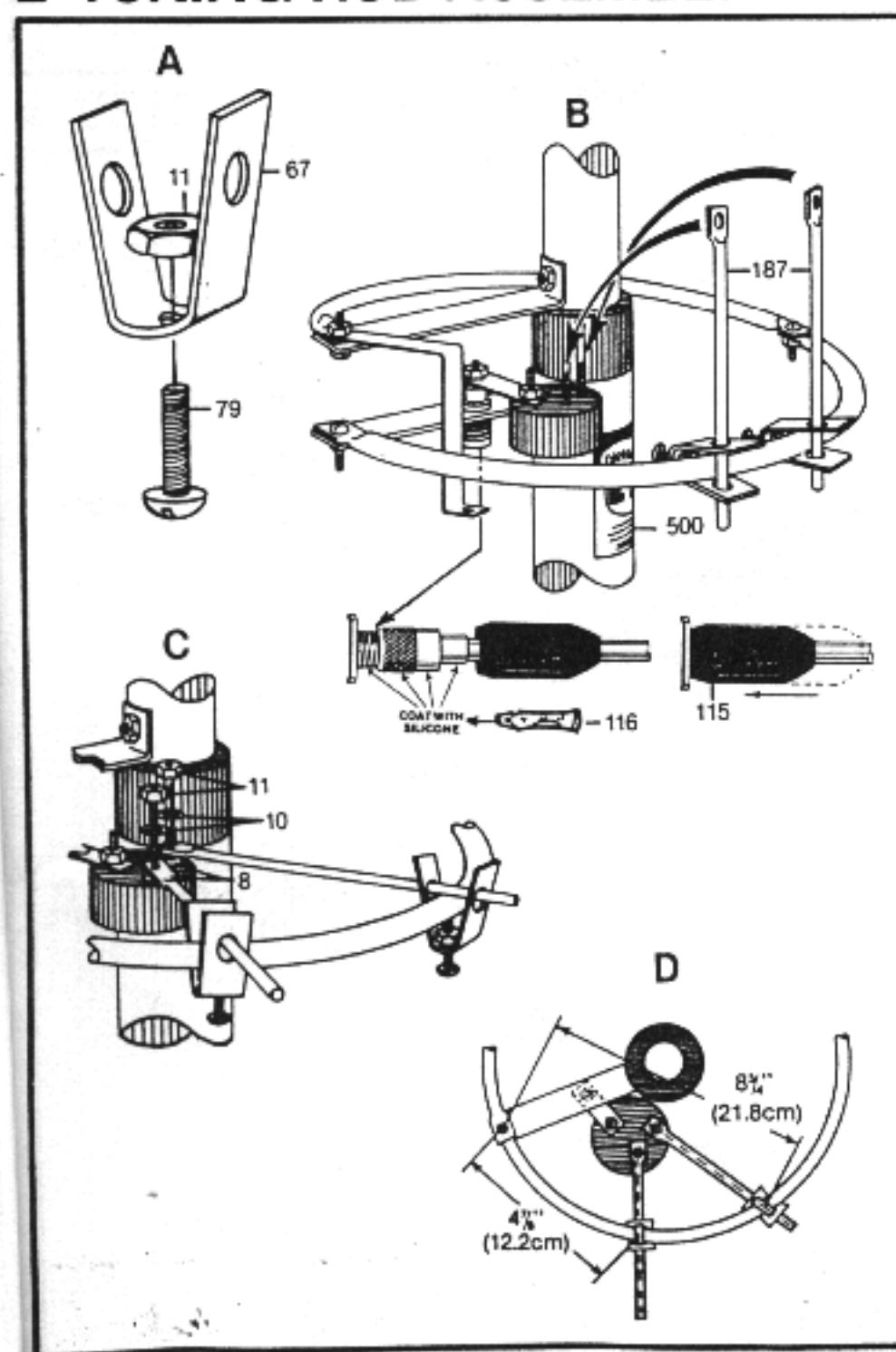
These voltage and resistance measurements will most likely uncover any electrical problem. Table II will help you to check mechanical functions.

# 1 RING SECTION & MATCHING NETWORK ASSEMBLY



| P/N | DETAIL | DESC.                         | SIZE                               | QTY. |
|-----|--------|-------------------------------|------------------------------------|------|
| AA  |        | BASE SECTION                  | 1 1/2" OD (33.3cm) x 48" (121.9cm) | 1    |
| 186 |        | MATCHING NETWORK ASSEMBLY     | 2" (5.08cm)                        | 1    |
| 190 |        | ALUMINUM RING SECTION         | 17" x 3/8" (43.2 x .95cm)          | 2    |
| 189 |        | ALUMINUM CONNECTING STRAP     | 4 1/8" x 3/8" (12.4 x .95cm)       | 1    |
| 124 |        | ALUMINUM CONNECTOR STRAP      | 1 1/2" x 1/4" (3.75 x 1.1cm)       | 1    |
| 79  |        | SS R.H. MACHINE SCREW         | #8-32 x 1/2" (1.27cm)              | 3    |
| 10  |        | SS INTERNAL TOOTH LOCK WASHER | #8                                 | 5    |
| 11  |        | SS HEX NUT                    | #8-32                              | 5    |
| 8   |        | ALUMINUM FLAT WASHER          | #8                                 | 1    |

## 2 TUNING ROD ASSEMBLY

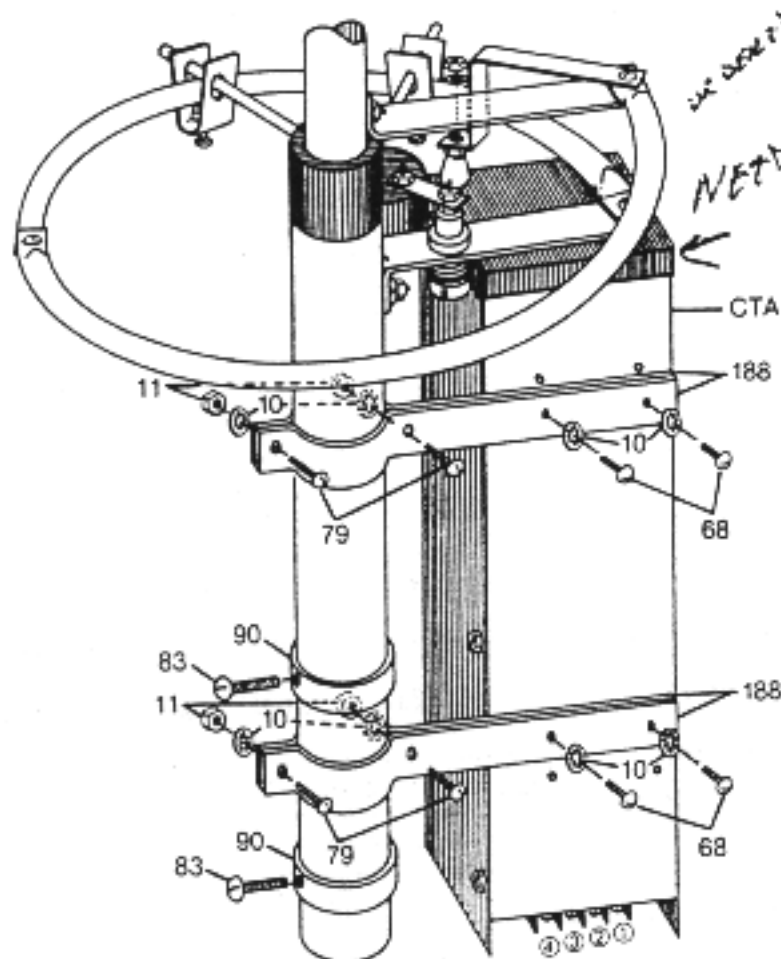


|     |  |                               |                      |   |
|-----|--|-------------------------------|----------------------|---|
| 187 |  | ALUMINUM STRAIGHT TUNING ROD  | 5 1/2" (13.97cm)     | 2 |
| 67  |  | CR ALUMINUM TUNING ROD CLAMP  |                      | 2 |
| 79  |  | SS MACHINE SCREW              | #8-32 x 1/2" (1.3cm) | 2 |
| 10  |  | SS INTERNAL TOOTH LOCK WASHER | #8                   | 2 |
| 11  |  | SS HEX NUT                    | #8-32                | 4 |
| 8   |  | ALUMINUM FLAT WASHER          | #8                   | 2 |
| 115 |  | VINYL CONNECTOR BOOT          | 2" (5.08cm)          | 1 |
| 116 |  | SILICONE GREASE PACKET        |                      | 1 |
| 500 |  | DANGER LABEL                  |                      | 1 |

### WARNING:

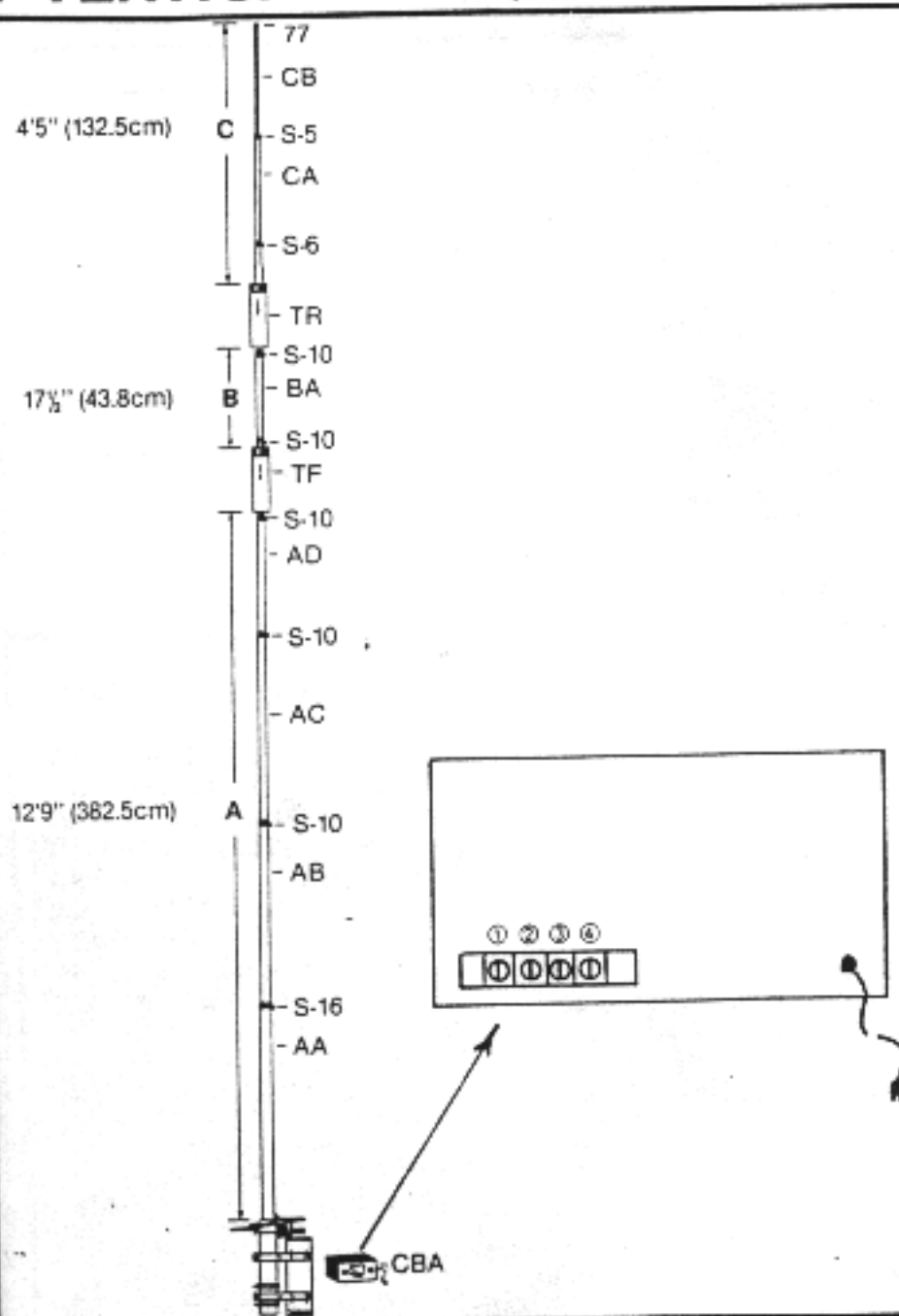
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### 3 CAPACITOR TUNING ASSEMBLY



| P/N | DETAIL | DESC.                          | SIZE                                       | QTY. |
|-----|--------|--------------------------------|--|------|
| CTA |        | CAPACITOR TUNING ASSEMBLY      | 3 1/2" x 3 1/2" x 12" (8.9 x 8.9 x 30.5cm) | 1    |
| 188 |        | FORMED ALUMINUM MOUNTING CLAMP | 8" (20.3cm)                                | 4    |
| 79  |        | SS R.H. MACHINE SCREW          | #8-32 x 1/2" (1.27cm)                      | 4    |
| 10  |        | SS INTERNAL TOOTH LOCK WASHER  | #8   | 8    |
| 11  |        | SS HEX NUT                     | #8-32                                      | 4    |
| 90  |        | MAST MOUNT RING CLAMP          |  | 2    |
| 83  |        | SS MACHINE SCREW               | #1/4-20 x 1 1/2" (3.18cm)                  | 2    |
| 68  |        | SS MACHINE SCREW               | #8-32 x 3/4" (.95cm)                       | 4    |

### 4 VERTICAL ASSEMBLY



|      |  |                      |  |   |
|------|--|----------------------|--|---|
| CBA  |  | CONTROL BOX ASSEMBLY | 4 1/2" x 6 1/2" x 3" (10.8 x 15.9 x 7.6cm) | 1 |
| S-16 |  | SS WORM CLAMP        | 1 3/4" (4.4cm)                             | 1 |
| S-10 |  | SS WORM CLAMP        | 1 1/2" (3.5cm)                             | 5 |
| AB   |  | ALUMINUM TUBING      | 1 1/2" x 48" (3.2 x 121.9cm) .058" Wall    | 1 |
| AC   |  | ALUMINUM TUBING      | 1 1/2" x 48" (2.9 x 121.9cm) .058" Wall    | 1 |
| AD   |  | ALUMINUM TUBING      | 1" x 36" (2.5 x 91.4cm)                    | 1 |
| TF   |  | 10 METER TRAP        | 16 1/2" (42.2cm)                           | 1 |
| BA   |  | ALUMINUM TUBING      | 1" x 17" (2.5 x 43.2cm)                    | 1 |
| TR   |  | 15 METER TRAP        | 19" (48.3cm)                               | 1 |
| CA   |  | ALUMINUM TUBING      | 3/8" x 36" (1.3 x 91.4cm)                  | 1 |
| CB   |  | ALUMINUM TUBING      | 3/8" x 24" (.95 x 61.0cm)                  | 1 |
| 77   |  | BLACK PLASTIC CAP    | 3/8" (.95cm)                               | 1 |
| S-6  |  | SS WORM CLAMP        | 3/4" (1.9cm)                               | 1 |
| S-5  |  | SS WORM CLAMP        | 3/8" (1.3cm)                               | 1 |

TABLE I

Voltage measurements from the terminal strip of the R3 control box.

Apply primary power and turn the control box "ON". The following AC voltages should be obtained.

|                       |        |
|-----------------------|--------|
| PIN 1 to PIN 2        | 0 Vac  |
| PIN 1 to PIN 3        |        |
| Tune switch to right  | 28 Vac |
| Tune switch to left   | 24 Vac |
| Tune switch at center | 0 Vac  |

|                       |        |
|-----------------------|--------|
| PIN 1 to PIN 4        |        |
| Tune switch to right  | 24 Vac |
| Tune switch to left   | 28 Vac |
| Tune switch to center | 0 Vac  |

Variations of  $\pm 20\%$  are acceptable.  
Readings were taken with 20K ohm per volt VOM.

TABLE II

Resistance measurements on capacitor tuning assembly terminal strip.

|                |  |
|----------------|--|
| PIN 1 to PIN 2 | between 100 and 1000 ohms (Pot. Winding) |
| PIN 1 to PIN 3 | 560 ohms ( $\frac{1}{2}$ motor winding)  |
| PIN 1 to PIN 4 | 560 ohms ( $\frac{1}{2}$ motor winding)  |
| PIN 3 to PIN 4 | 1120 ohms (total motor winding)          |

Variations of  $\pm 20\%$  are acceptable.  
Readings were taken with 20K ohm per volt VOM.

CHART I TROUBLE SHOOTING CHECK POINTS

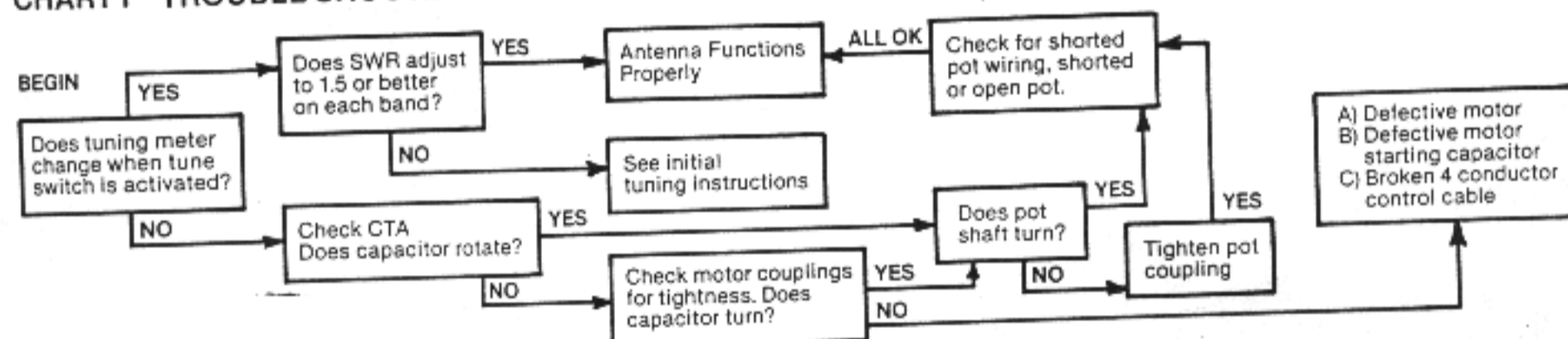
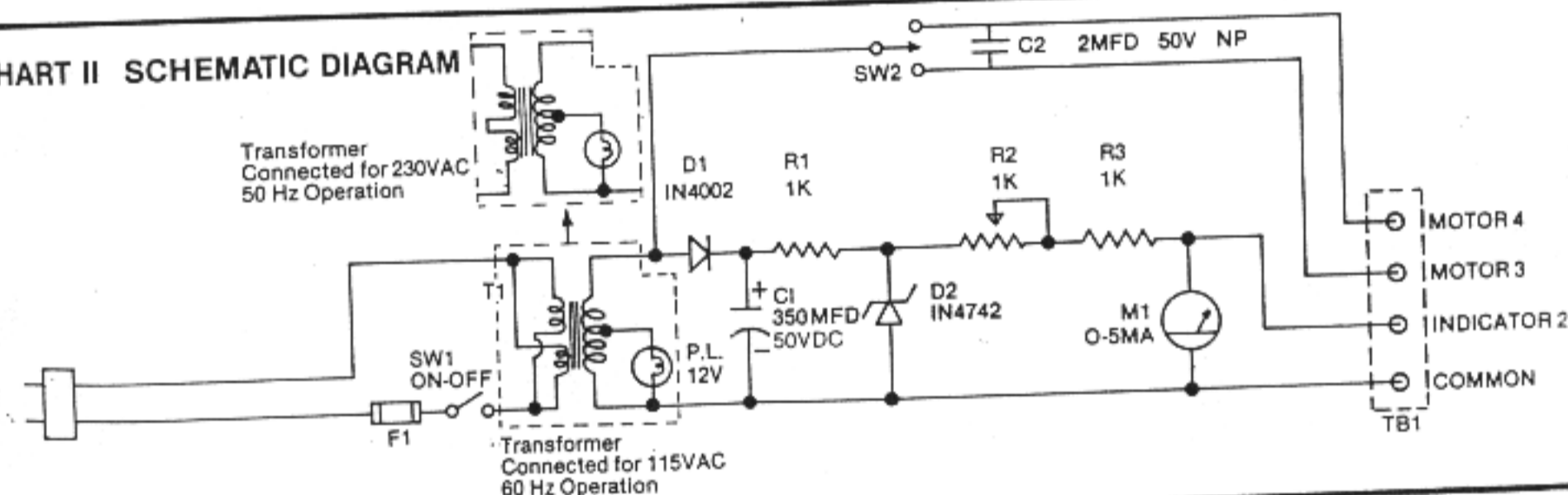


CHART II SCHEMATIC DIAGRAM



## LIMITED WARRANTY:

CUSHCRAFT CORPORATION, P.O. BOX 4680, MANCHESTER, NEW HAMPSHIRE 03108, WARRANTS TO THE ORIGINAL CONSUMER PURCHASER FOR ONE YEAR FROM DATE OF PURCHASE THAT EACH CUSHCRAFT ANTENNA IS FREE OF DEFECTS IN MATERIAL OR WORKMANSHIP. IF, IN THE JUDGEMENT OF CUSHCRAFT, ANY SUCH ANTENNA IS DEFECTIVE, THEN CUSHCRAFT CORPORATION WILL, AT ITS OPTION, REPAIR OR REPLACE THE ANTENNA AT ITS EXPENSE WITHIN THIRTY DAYS OF THE DATE THE ANTENNA IS RETURNED (AT PURCHASER'S EXPENSE) TO CUSHCRAFT OR ONE OF ITS AUTHORIZED REPRESENTATIVES. THIS WARRANTY IS IN LIEU OF ALL OTHER EXPRESSED WARRANTIES. ANY IMPLIED WARRANTY IS LIMITED IN DURATION TO ONE YEAR. CUSHCRAFT CORPORATION SHALL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES WHICH MAY RESULT FROM A DEFECT. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS OR EXCLUSIONS OR LIMITATIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION AND EXCLUSION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. THIS WARRANTY DOES NOT EXTEND TO ANY PRODUCTS WHICH HAVE BEEN SUBJECT TO MISUSE, NEGLIGENCE, ACCIDENT OR IMPROPER INSTALLATION. ANY REPAIRS OR ALTERATIONS OUTSIDE OF THE CUSHCRAFT FACTORY WILL NULLIFY THIS WARRANTY.



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